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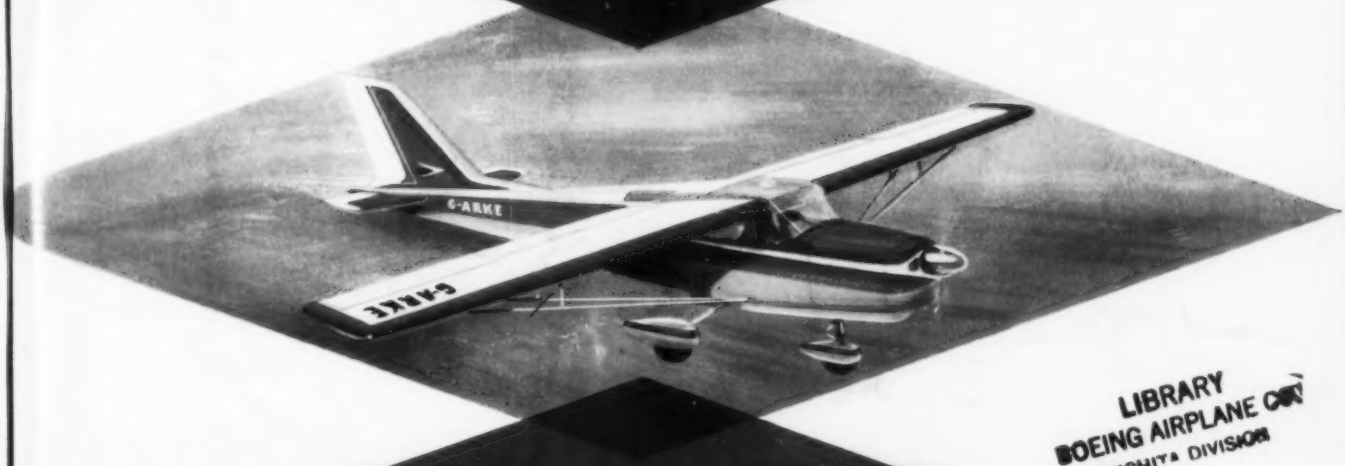

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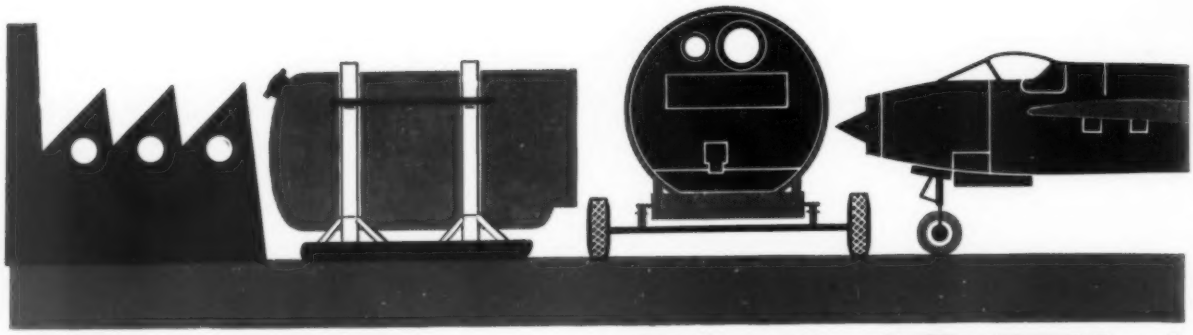

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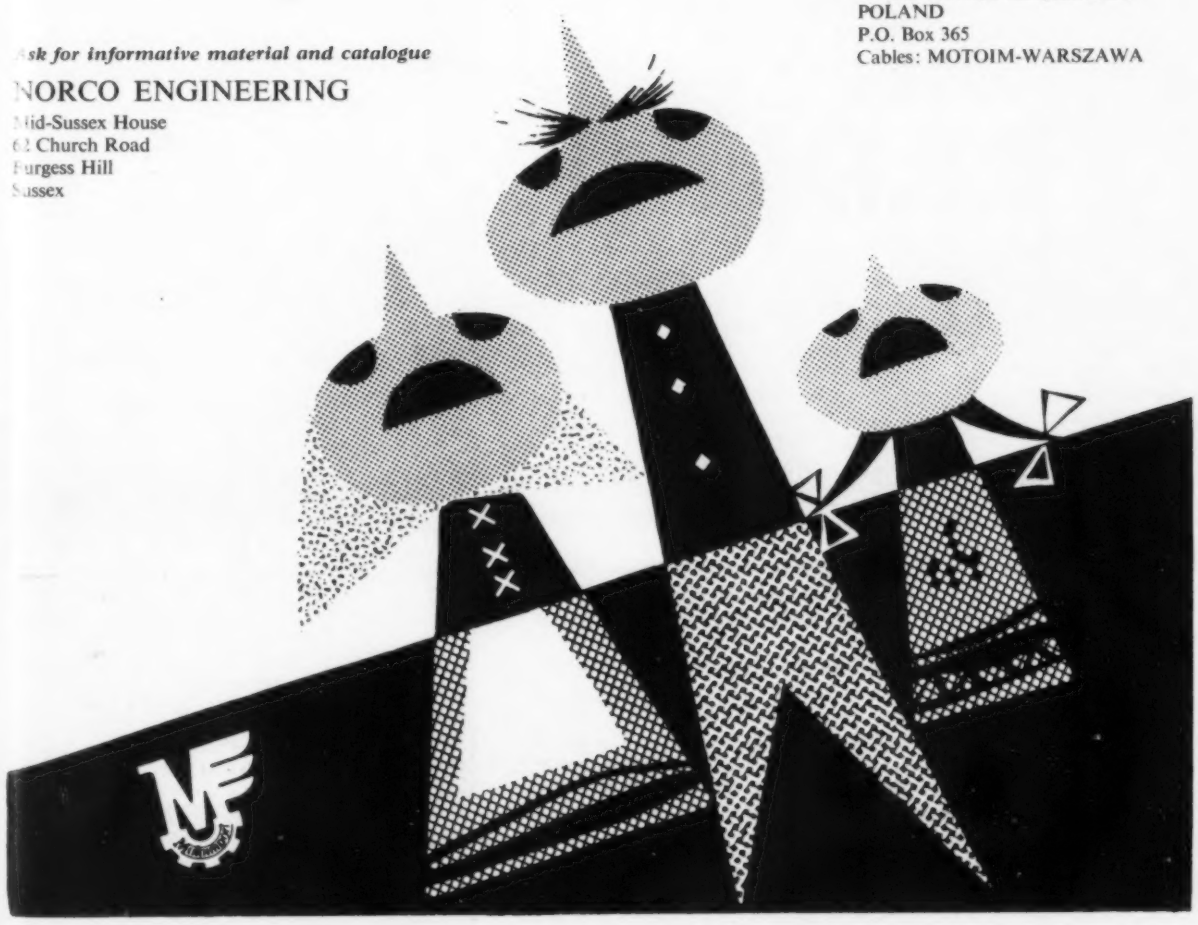

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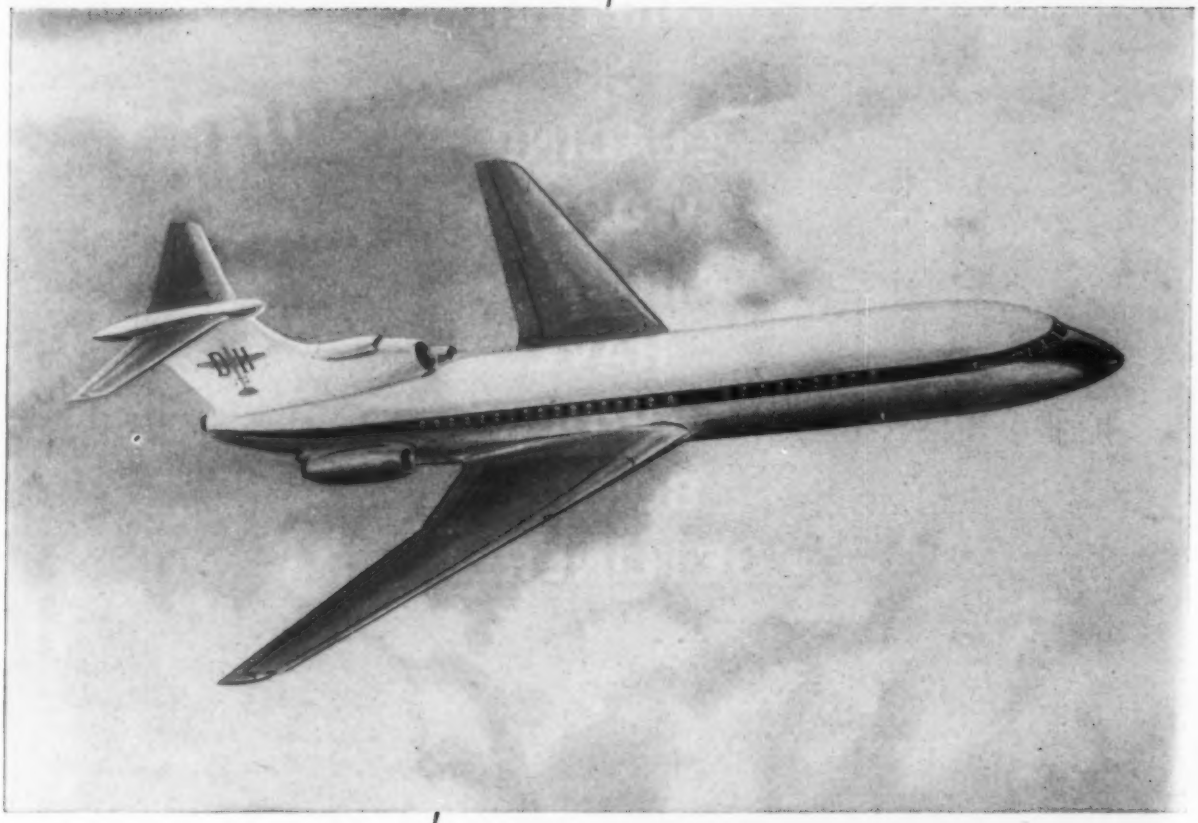

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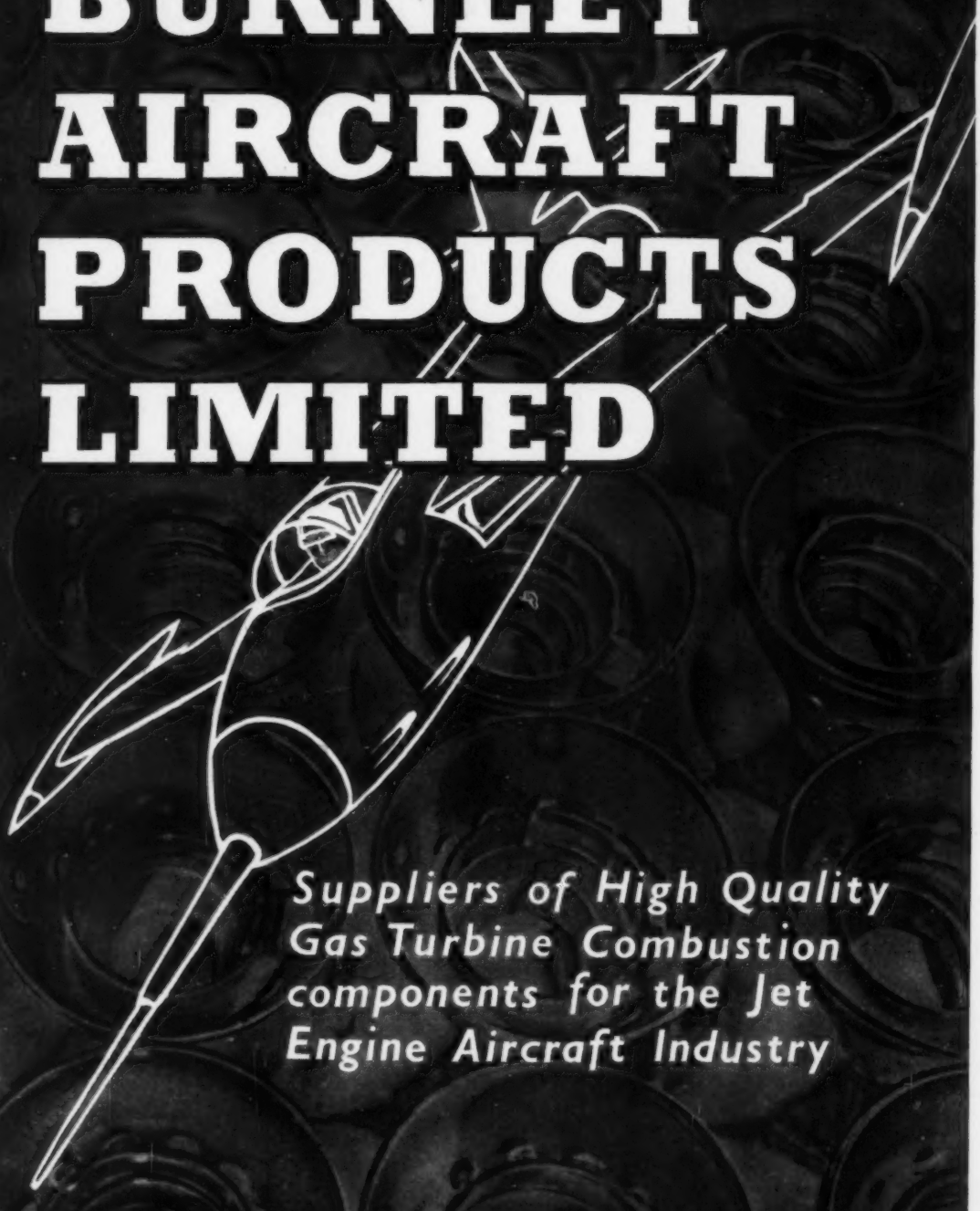

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No 2721 VOLUME 79 THURSDAY 4 MAY 1961

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Sharing Experience

EVERYONE, including the Ministry of Aviation, agrees that accidents are prevented by sharing experience. But only lip-service is paid to this idea in the United Kingdom; there is no organization, either within or without the Ministry, which selects and publishes information about accidents and incidents so that lessons can be learned and similar occurrences avoided. When we reviewed the Ministry's Survey of Accidents for 1958, which was not published until 1961 (see *Flight*, January 6), we recommended certain improvements. This drew from the Transport Flight Safety Committee a letter, published in our issue of January 20, explaining that body's efforts to disseminate the safety information by means of a bulletin called *Flight Safety Focus*. Though *Focus* is for private circulation only, it is obviously an excellent move towards full publication of information about air safety.

But we are still a very long way behind the Americans in this respect. Week by week the US Flight Safety Foundation publishes its *Accident Prevention Bulletin*, bearing the slogan "Share Your Experience." A recent addition includes an item under the heading "near miss," relating the circumstances of a near-collision caused by the fact that one of the two airliners concerned was flying towards the sun and could not have seen the other. The circumstances are related in some detail and the item is "passed on as a reminder."

Reading it inevitably makes us wonder what experience might be shared following the near-miss over London Heathrow on February 21—a subject which we are encouraged to see has been raised in Parliament. But even if the full circumstances cannot be published promptly without prejudicing relations with foreign countries, would it not be possible for Ministry civil aviation information circulars to disseminate promptly, on a no-names, no-pack-drill basis, the circumstances of such disturbing incidents? The information and lessons to be drawn must be published somehow; ways can always be found to avoid causing offence. The object of publishing accident information is not primarily to apportion blame—it is to prevent recurrences.

Out of the Kennel

WITH the exception of two agricultural types of 1955 no British light aeroplane has been the subject of a *Flight* cutaway drawing since November 1949 (and we recollect that the subject of that eleven-year-old drawing never got into the air). How welcome, then, is the Beagle-Auster A109 Airedale, described in the centre pages of this issue.

Since the untimely demise of Miles Aircraft as major aircraft constructors, in 1947, the little Auster company up in Leicestershire has ensured that Britain's last production line of light aircraft never dried up. Compared with the full spate of American lines, of course, this represented a mere trickle; nevertheless the sturdy and reliable Auster family are performing manifold tasks in arduous circumstances in all parts of the world.

It will be seen that the first of the Beagle-Austers is anything but revolutionary; it is a determined and successful attempt at removing deficiencies of the Auster line while losing none of the virtues. Design is thus not uninhibited, though the reverse is true of the single- and twin-engined private and executive aeroplanes now taking shape, on paper or in fact, in the Masefield Beagle and Beagle-Miles design offices. The first is certainly taking shape in fact (and a shapely shape we predict it will be). We further predict that when dissected by a *Flight* artist in the months to come that shape will be seen as the embodiment of truly advanced techniques.

FROM ALL QUARTERS

BREAKTHROUGH SIGNATURE: Lord Douglas of BEA signs a contract for three Argosies in London on April 27 (see news-item below). Others, l to r: Mr W. S. D. Lockwood, AWA; Mr A. H. Milward, BEA; Sir Aubrey Burke, Hawker Siddeley; Mr J. A. R. Kay, Hawker Siddeley. Standing, right, is BEA's secretary, Mr H. Marking. The Argosies will be the first pure freighters operated by a British airline

BEA Sign Argosy Order

PUTTING his signature to BEA's £1½m order for three AW.650 Argosies in London on April 27, Lord Douglas, the chairman, committed his airline to doubling its freight capacity. The corporation's seven DC-3 freighters (Pionair Leopards) are to remain in business, and the Argosies (whose annual 16m ton-miles capacity about equals BEA's *total* freight uplift in 1960) will be devoted exclusively to all-freight work. The first will be delivered in November, and all three will, to quote Lord Douglas, "be earning their keep by February."

Mr A. H. Milward, BEA's chief executive, said that about two-thirds of BEA's freight was carried in passenger aircraft; this was, at the moment, the most economical method of carrying it, but the Argosy would allow carriage of any type of bulky freight—making possible, in Lord Douglas's words, "a very great expansion indeed."

The sales director of Hawker Siddeley, Mr J. A. R. Kay, talked about freight rates. A study by the London School of Economics, he said, had suggested that if European rates were cut by 30 per cent traffic volume would increase by 60 per cent; and if they were reduced by 40 per cent traffic would double. It was thought that bulky cargo of the kind unsuitable for existing aircraft formed a potential market available to the Argosy, perhaps as high as 40 per cent of existing air freight traffic.

Lord Douglas hoped not only to cut freight rates in Europe but also to simplify them: "There are 4,000 commodity rates in Europe. This is far too many, and we hope to narrow these down to very many fewer indeed, perhaps eight." Mr Milward endorsed the need to simplify commodity rates but did not expect immediate drastic reductions in rates. "Our problem is to carry the existing cargo offering at present rates," he said. BEA's first job was to make air cargo pay rather than to cut rates—"just because we have bought a new freighter does not mean that we can cut rates straight away."

BEA will introduce Argosies first on the Copenhagen - Milan - Manchester routes. Eventually they will take over all BEA's scheduled all-cargo operations, domestic and international. Asked about competition with British Railways, Lord Douglas said: "We don't intentionally go out to take freight from British Railways, but obviously there is an element of competition."

Mr Kay felt he was speaking for the whole British industry in thanking BEA for the way they had consistently supported the British aircraft industry. He referred to BEA's "world-wide reputation for efficiency, enterprise and sound procurement policy," and said that Hawker Siddeley had been "impressed with the thoroughness and enthusiasm" which BEA was devoting to the expansion of the air-freight market. Mr W. S. D. Lockwood, AWA's managing director, hoped that the order would be the forerunner of others.

Swedish Gnome Order

IN Stockholm last week a contract worth approximately £1m, for the supply of Gnome engines to the Royal Swedish Navy, was signed by Mr W. F. Shaylor, sales director of the de Havilland Engine Co Ltd. These engines are to power Boeing/Vertol 107 and Agusta Bell 204B helicopters. This is the second £1m contract negotiated by the DH Engine Co within the last four months, and the first of its kind with an Outer Seven country. The previous £1m contract was with Agusta of Milan. The Swedish order for Boeing/Vertol 107s was also announced last week.

"Know-how" Payments Part of Profits

IN the Court of Appeal last week it was decided that payments to Rolls-Royce Ltd by foreign governments or companies for technical knowledge to enable them to manufacture the company's jet engines did not arise from sale of a capital asset. Such payments were not, therefore, excluded from computation of company profits. This decision followed an appeal by the Crown from an order of Mr Justice Pennycuick in the Chancery Division last year (*Flight*, June 3, 1960), ruling that Rolls-Royce should not be assessed for taxation purposes on such payments.

The company had contended that knowledge and secret information they acquired was a fixed capital asset; the Crown contended that lump sums were received in the normal course of trade. Lord Justice Holroyd Pearce remarked in the course of his judgment that "knowledge sold in the present case was in the main the transient by-product of advancing engineering science. . . . It was the kind of knowledge which could easily merge its character of a fixed asset into that of a trading asset." Receipt of the sums in question was part of the annual profit or gain accruing from the company's trade; the sums were trading receipts on revenue account.

Two More for the Shuttleworth Trust

AT a ceremony in Luton last week, Mr Arthur Summers, managing director of Hunting Aircraft, formally handed over to Air Cdre A. H. Wheeler, aviation trustee of the Shuttleworth Collection, the Percival Gull 6 G-ADPR which was delivered to Jean Batten in September 1935. In this aircraft, Miss Batten made record flights to South America in 1935, to Australia and New Zealand in 1936 and from Australia to England in 1937. She was awarded the Britannia Trophy for these flights in 1935 and 1936. Other pilots set up further records in the Gull during those years.

The aircraft was requisitioned by the RAF at the outbreak of World War II and flown for about 200hr on communications work.

"FLIGHT" NEXT WEEK—a special issue surveying the world's VTOL aircraft. Usual features will also appear.

ROLLED OUT: XF923, the first Bristol 188 all-steel research aeroplane, pictured on April 26 after coming out of its assembly hangar for the first time. The de Havilland Gyron Junior DGJ.10R powerplants are now being run, and chief test pilot Godfrey Auty may fly the aircraft in July

A LONG LOOK BACK: Grouped before the famous Percival Gull Six G-ADPR (see "Two More for the Shuttleworth Collection") are seven men who were concerned with the aircraft over a quarter of a century ago and who are still with the company (under its present title of Hunting Aircraft Ltd) which built it. L to r: Messrs R. Woolley, design department; J. L. Bradley, security; J. W. H. Capron, ratefixing; C. Harding, experimental; H. C. Benton, Jabroc construction; W. A. Summers, managing director; J. E. Lavender, service manager

In 1946 it was returned to Percival Aircraft at Luton and used by the company for a further 150hr until 1955. It is now refurbished and restored as nearly as possible to its original condition.

The first Hunting Jet Provost, G-AOBU, was also symbolically handed over to the Trust, but is first being lent to various technical colleges for instructional work. It will complete the Trust's set of all RAF basic trainers since the Service was formed.

Present at Luton were seven of the men who originally helped to build the Gull at Rochester in 1935; and before departing for Old Warden the aircraft was flown past by Hunting chief test pilot S. B. Oliver with a Jet Provost T.3 in formation alongside.

Seeing Fighter Command

ON Monday last, the day when Fighter Command was officially assigned to NATO (*Flight*, April 20), the Minister of Defence was visiting three of its stations. Mr Watkinson went first to North Coates in Lincolnshire, the Bloodhound SAGW station, then to Wattisham in Suffolk. From Wattisham he was making a helicopter trip to a radar station; then returning to watch a "scramble" by Lightnings and Javelins and to see Firestreak maintenance.

Hovercraft Appointments

THREE major appointments have been announced by Hovercraft Development Ltd, the company set up by the National Research Development Corporation to sponsor the Hovercraft air-cushion vehicles. Cdr L. A. Sweny, a director of the company since 1959

Cdr L. A. Sweny (left) and Mr W. A. Pennington

and formerly manager of Marconi's aeronautical division, becomes managing director; and Prof H. B. Squire, Zaharoff Professor of Aviation at Imperial College, London, and previously (1934-49) a scientific officer at RAE Farnborough, joins the board. The company remains under the chairmanship of Mr D. Hennessey, other directors being Mr C. S. Cockerell and Mr H. K. Turner.

The third appointment is that of Mr W. A. Pennington, BEng(Mech)Hons, AFRAeS, as chief engineer. He joined the English Electric Co aircraft division in 1951 from the NGTE, later becoming principal project officer, English Electric Aviation Ltd.

HATFIELD VISIT last week by the Minister of Aviation, Mr Peter Thorneycroft (third from left), seen viewing a 3,000-ton press for applying stiffeners to aircraft skins. With him (left to right) are Sir George Gardner, Controller of Aircraft, MoA; Mr H. G. Sturgeon, managing director, DH Aircraft; Mr T. Gilbertson, DH production manager; Sir Aubrey Burke, deputy chairman, Hawker Siddeley Aviation; and Mr R. F. Prosser, the Minister's private secretary

Assisting Noise Research

ENDOWMENT by Hawker Siddeley Aviation Ltd of a readership and lectureship in noise and vibration research at Southampton University has recently been announced. It forms the first industrial contribution in support of a General Appeal Fund which the university is launching.

The Department of Aeronautical Engineering at Southampton, under Prof E. J. Richards, has specialized in research associated with noise and vibration; it receives support for this work from many sources, including the USAF. The university intend to set up an MSc course to extend research in these directions.

In a comment on the endowment the technical director (aircraft) of Hawker Siddeley Aviation, Mr S. D. Davies, said that unless a vigorous programme of research and experimentation into aircraft noise were commenced immediately the problem might become a limiting factor on future aeronautical progress.

War-film Pilots Wanted

IN *Flight* for March 10 was pictured one of three Tiger Moths ingeniously converted by Film Aviation Services Ltd into Fokker D.VIIs for the Horizon Pictures film *Seven Pillars of Wisdom*. Now comes news that Capt John Crewdson, the aviation company's managing director, has been appointed air consultant for two more big feature films, one (*The Longest Day*, Daryl Zanuck Productions) dealing with the D-day landings in Normandy and the other (*The War Lover*, Columbia) telling the story of a B-17 squadron.

The invasion film will include sequences for which Me109s, Spitfires, Hadrian gliders, Dakotas and probably a Mustang will be flown. The aircraft exist but pilots are needed, and any who can help are being asked urgently to contact Capt Crewdson at Stone Court, Smallfield Road, Horley, Surrey (Horley 3652).

IN BRIEF

APPOINTED a director of the main board of Bristol Siddeley is Dr E. J. Warlow-Davies, BSc, BA, DPhil(Oxon), who has been chief engineer (aero) and a special director since the company's formation two years ago. His career, in Tasmania, Britain and Canada, has included appointments in government service, with a railway company and with Rolls-Royce

Speed achieved by the North American X-15 in its flight on April 21 was 3,074 m.p.h. and not 3,140 m.p.h., the National Aeronautics and Space Administration announced on April 25.

The National Aeronautics and Space Administration's S-15 gamma-ray astronomy satellite, designated Explorer 11, was successfully placed in orbit from Cape Canaveral by Juno 2 on April 27. The planned orbit was from 300 to 700 miles' altitude at an inclination of 28°.

Design of the Sikorsky S-64 all-purpose transport helicopter, first of a series of turbine-powered heavy lift aircraft, has been completed in preparation for manufacture of the first prototype models later this year. The S-64 is successor to the S-60 Skycrane.

On rotary-wing aviation day (June 1) at the Paris Show a competition is being held for which a first prize of NF10,000 (about £750) is being awarded by the Aero Club de France. Tests include rapid climbs and speed circuits.

Two world records have been claimed by the Soviet Union. On April 28 a height of 34,100m (111,877ft) was achieved by Georgy Kosolov in an E-66; and on April 29 an Antonov An-10 carrying 100 passengers set up a new record for aircraft weighing over 3,000kg (6,614lb) by covering a 500km (311-mile) closed circuit at an average speed of 730.616km/hr (454 m.p.h.).

The Canadian Government have bought 24 Hiller 12E helicopters from Hiller Aircraft Corporation. Three are for the RCAF and the remainder for the Canadian Army. Other 12E orders include five for Okanagan, the big Canadian helicopter charter operators (who already have three) and five for Argentina, where the Government of Buenos Aires province will use them for agricultural and other civil work.

A seven-stage Trailblazer I solid-fuel rocket was successfully launched by NASA from Wallops Island on April 21. After the rocket had reached a height of 175 miles on its first three stages, the remaining four stages were used to drive a small steel pellet back into the Earth's atmosphere at about 25,000 m.p.h. The object was to assist in re-entry studies by NASA and Massachusetts Institute of Technology, and in meteor investigations by the USAF and Harvard College Observatory.

Three special numbers of our associated journal *The Autocar* are appearing this month: [Home Servicing and Repairs (May 5),] [British Cars and Accessories (May 12)] and Continental Cars (May 19).

Shackleton show champion — the Beagle-Auster Airedale. Two hours before the airfield opened on the final day spectators were gathered around it. A description and cut-away drawing appear on pages 593-596

200 LIGHT AIRCRAFT AT THE SHACKLETON AVIATION MEETING

Weekend in Wonderland

"Flight" photographs

IF you want to sell aeroplanes, you must fly them. This simple lesson, so axiomatic, but previously little understood except by Tim Vigors and the Piper circus, now seems to have registered with nearly every representative of light aircraft in the country.

At Coventry last Friday, Saturday and Sunday—the Shackleton Sales Weekend—to be airborne was to be in business. Aircraft were lining up eight or nine deep at the runway holding point, demonstrations of no less than 45 different types continued incessantly, and a break in R/T was as rare as flowers in a foundry.

The single runway was swamped by the number of aircraft movements, and the single radio channel, on which was simultaneously offered radar fixes, QGHs, VDF, airfield circuit and ground-control instructions, was inadequate to cope with the press of R/T calls. Though agreeing that things were occasionally "fraught," air traffic control quickly reorganized to deal with this unprecedented influx under the overcast skies that persisted throughout.

Aviation Weekends at Kidlington were never like this. A few forlorn, staidly-painted British second-hand aircraft of another era barely got a look in among literally scores of bright, new, shining, swept-fin moderns—the Gulfstream, *beau ideal* of all executive specials; the Avro 748, which did a touch-and-go on one engine during the afternoon demonstrations; the agile Czech Aero 145, MetaSokol and Morava, the last-named demonstrated by the incomparable Blaha and shown by Peter Clifford; Airwork's slinky Cessnas, present in tremendous force; the Beech range, effectively presented at last by Short Brothers and Harland; and Rollason's dainty Jodels. But the star, the never-seen-without-a-crowd celebrity, was Beagle-Auster's Airedale. Alongside it was the new A.61 Terrier. Sisters under their skins they may be, but what a metamorphosis Beagle has wrought on the Auster of former years. A contract for six, for delivery to W. S. Shackleton Ltd, was signed when the aircraft landed. A scheme—Beagle Air Finance—has been announced whereby all Beagle aircraft can be obtained at favourable hire-purchase rates.

The German contingent was well represented by Flair Aviation's two Bolkow 107Cs and the four-seater 207, and Dornier were there with the Do27 and Do28, which, flapped and slotted, flung themselves around the sky or, fishtailing and wings rocking, swept feet above the runway or volplaned down—may we use the term again?—for a dead-stick landing. And all the day long Air Rent's three little red Aircoupes, fully loaded, were beating around the circuit on demonstration after demonstration. The Wassmer Super IV, in primrose and black, made its first appearance in England. McAlpine Aviation showed a fine pair of Piaggio 166s, and the president and

An early morning view of Coventry last weekend, before the aircraft ranks filled up. This could be a foretaste of light aircraft things to come

Short Bros put up a fine show with the Beechcraft range. Lifting off here is the Travelair (at right)

Omnipol representives Gp Capt Edward Mole (far left) and Peter Clifford discuss the MetaSokol with show organizers W. S. Shackleton (centre right) and Keith Shackleton

Left, Koffmane takes the Do28 into the air and, right, Blaha flies past in the Morava. Handling impressions of both these aircraft are recorded below

vice-president of the Helio Aircraft Corporation were there to hand over to McAlpine, who represent them, an executive Helio Courier.

Many who had never seen a Beech aeroplane before in their lives now had the opportunity to see every aircraft in the range. For months Shorts have been quietly assessing the aircraft and the market, but at Coventry they really cut loose, time and again every aircraft being airborne at once. A Queen Air was handed over to the British Oxygen Co Ltd on the first day of the show. The Baron arrived from Hanover, was ably demonstrated and left for Germany again the same day. It is powerful and fast, a Travelair with a deeper growl. De Havilland were at Coventry with the Dove 8 and the Heron, the latter impressively getting upstairs on three engines from a wet runway. After the first well-publicized Dove 8 delivery, the DH sales department has quietly gone ahead with the sale of another four or five aircraft, most of them now in highly contemporary colours. The show model was yellow and black.

HANDLING NOTES FROM COVENTRY

OCCASIONS like the Shackleton Sales Weekend offer opportunities for flying and assessing new aircraft. Mark Lambert here gives brief impressions of handling the German Dornier Do28 and the Czechoslovak Morava.

DORNIER Do28 I have known the Do28 for a long time, having flown the prototype, D-IBOB, with 180 h.p. engines in Paris two years ago, and the same aircraft with 250 h.p. engines at Hanover last year. At the Shackleton meeting I flew one of the first 12 production aircraft, D-IATA, operated by non-IATA airline Deutsche Nahluft Verkehr. Dornier hope to complete 36 this year.

The Do28 is really a twin-engined IFR version of the Do27 and the two aircraft are noticeably similar to handle. An aileron wheel replaces the plain stick and the panel has been filled up with IFR instruments, miniature engine gauges and small radios, for which there is just enough room beneath the enormous combined door and windscreen panels. The Do28 wing is larger and tankage greater, the fin is altered and the Lycoming O-540 250 h.p. engines are outrigged in that distinctive way, but the cabin and general arrangement are otherwise the same as in the Do27. The Do28 twin includes one radio and the IFR equipment as standard, and sells for DM210,000 (£16,550) in Germany. I flew it with test pilot Bernd Koffmane.

Gross weight is 5,400lb and wing loading 22lb/sq ft, but the Do28 can be flown at 25kt i.a.s. and its best angle of climb speed of 50kt is also its take-off safety speed. This is with 35° of flap and inner aileron sections drooped; and the rate of climb is then 1,000ft/min. Take-off distance to 50ft is only 1,000ft. I flew with a windmilling propeller to starboard and full power to port at 45kt, at a remarkably high angle of attack. With 75 per cent power on both engines we bored along at over 145kt and at 65 per cent we made 120kt. Ranges at these powers are respectively 660 and 745 miles. In all flight conditions the controls were light and responsive but, not unexpectedly, a fair amount of co-ordination was required at the lowest speeds. Most STOL types behave like this, but the Dornier was better than some I have flown.

Visibility was splendid, even though there was not a great deal of room in front, but the noise-level at high powers a bit intense for long flights. Heat and ventilation could be controlled for both cockpit and cabin and there was a separate 60kg baggage compartment aft.

With an aft c.g., flaps up and power off the Do28 stalls at 40kt i.a.s.: with our forward c.g. we went into a nose-up *descente parachutale* at 50kt and descended at 1,000ft/min. With full flap—lowered with a mighty heave on the lever at 80kt or with an easier pull at lower speed—I could approach, power off, at 60kt and make a smooth three-point landing. Use of power greatly reduces minimum speed, but angle of attack increases markedly and short landing performance with plenty of power is really dictated by angle of attack, because one can fly but not really land at well below 30kt. I flew for some time with 35° of flap (15°, 35° and 45° settings are possible) and was astonished to see so large an aircraft remain fully controllable at speeds at which a Chipmunk would flop out of the sky. Lift seemed to depend on power rather than airspeed and there was always plenty of control in hand.

Perhaps most gratifying of all was that low-speed performance was little affected by loss of an engine. At 45kt, with one propeller windmilling and not feathered, I was quite happy with the nose pointing at the clouds and the ground behind my back. For airline purposes, this means that full advantage can be taken of short take-off performance while meeting engine-out safety requirements.

With 35° of flap and the aircraft trimmed in a glide I also applied full power to try the overshoot case. Pitch-up was naturally considerable, but I held it with one hand as we went into a 1,000ft/min climb. Retrimming was a slow business, the very large trim-wheel being low-geared, as it must be with a powerful v.i. tailplane. It is important to fly as much as possible trimmed, so that the tailplane does not overpower the elevator. Rudder trim was high-geared and very effective in counteracting asymmetric power.

Altogether, the Do28 was a fascinating low-speed experience. It was always light to fly, if a trifle sloppy, and remarkably manageable in surprising attitudes, as witness Koffmane's vertical climb and stall turn with asymmetric power, and his short take-offs in formation with the Do27.

L-200A Morava I first flew and reported on a Morava prototype at Paris two years ago and I remember it as a tractable, business-like aeroplane, not very subtle, but very economical. Last October a production Morava was demonstrated in Britain and I was surprised to hear that it was snagged by the ARB. But the snags have now been fully cleared and the ARB have granted a full public transport C of A. So I flew it again briefly at Coventry to see how it felt. The famous Czech pilot Blaha was demonstrating it with typical skill and vigour, rolling it and generally treating it as something much smaller.

Few people can consider the Morava beautiful, but it has a vast domed cabin with two big doors, separate front seats and a big bench in the back. Car-like rear windows give direct rearward vision. The roof has been considerably lowered to improve performance, since I first knew it, and the windscreen is now little more than two portholes placed between the extra-wide door frames and central pillar. Forward visibility is further restricted by d.v. window frame, a compass, and a glass thermometer tube on the central pillar. Instrumentation is comprehensive, including both inlet and outlet temperatures for the oil coolers, hydraulic system and parking brake pressures. Cabin heating and wing de-icing are by exhaust muff and there are temperature gauges for all three. The single engine-driven hydraulic pump has a manual stand-by, used also for raising parking-brake pressure.

Fuel is in the tip-tanks (with gauges) and wing tanks, with low-contents warning lights. Booster pumps will only work with the appropriate tank selected; and the 210 h.p. Walter M-337s will only start with the superchargers clutched in. Both engines and oil coolers have manually controlled gills. Present propellers are electric, variable-pitch units, but three-blade, hydraulic, constant-speed types are in prospect.

In the air the Morava was reasonably quiet and moved along at 270km/hr (168 m.p.h.) with superchargers in and 70 per cent power. The aileron wheel moved only 30° each way for full deflection, but forces were reasonable and response very good, particularly at low speed. Climb after take-off was 1,370ft/min with two up and half fuel. Trim changes with speed were firm, but with power they were very small, making an overshoot very comfortable.

With the left engine at continuous power and the right feathered I could trim hands-off at 180km/hr (112 m.p.h.), but residual loads right down to the buffet at 120km/hr (75 m.p.h.) were reasonable. The rudder trim wheel was much too difficult to turn. At 112 m.p.h. I was no longer able to hold heading, but aileron and elevator control were fully precise.

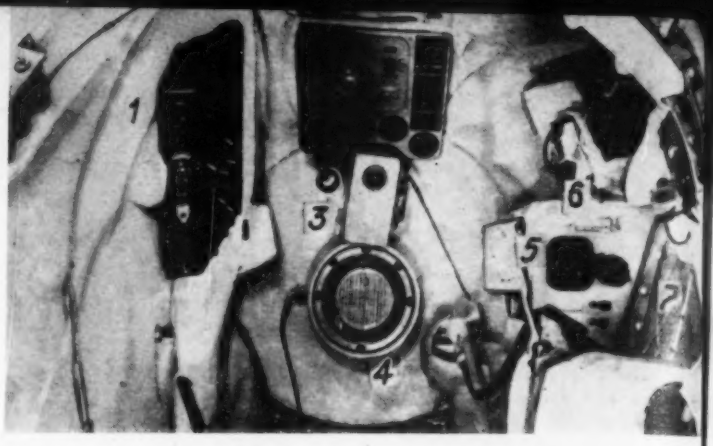
Trim changes with gear and flap extension at 180km/hr (112 m.p.h.) were small. The power-off rate of descent was a little slow, but flaps reduced stalling speed by over 20 m.p.h. With a forward c.g., trim was sufficient to hold 150km/hr (93 m.p.h.), but approach speed was 140km/hr (87 m.p.h.), crossing the hedge at 120km/hr (75 m.p.h.) and floating some distance. Undercarriage suspension was good and nosewheel steering not too heavy.

In my opinion, the Morava is still a plain business-like aeroplane; well over 100 have now been sold. The price is attractive, the performance good and full climatic protection is included in basic equipment. Skis can also be fitted.

C. M. L.

Missiles and Spaceflight

VOSTOK DETAILS



This photograph of the "Vostok" pilot's cabin interior accompanied the "Izvestia" description: 1, pilot's control panel; 2, instrument panel with globe; 3, television camera; 4, window with optical orientation device (see text); 5, orientation control lever; 6, radio receiver; 7, food container

THIS description of the Soviet satellite "Vostok" and Maj Gagarin's flight of April 12 is extracted from the article "Man's First Flight in the Cosmos" which was published in the April 25 issue of "Izvestia."

THE cosmic ship *Vostok* was created on the basis of the experience gained with the launches of the first Soviet spaceship-satellites. It comprises two basic parts:

(a) the pilot's cabin, which accommodates the cosmonaut, equipment for maintaining life activities, and the landing system;

(b) the instrumentation compartment, designed to accommodate instruments working during flight in orbit, and the retro-engine assembly of the spaceship.

After injection into orbit the spaceship-satellite separates from the final stage of the carrier-rocket. During flight the equipment on board works to a given programme, ensuring measurement of the parameters of the orbit, transmission to Earth of telemetric information and the television picture of the cosmonaut, two-way radio-communication with Earth, maintenance of the intended temperature régime, and air-conditioning in the pilot's cabin.

The equipment is controlled automatically, with the aid of programming devices on board and, in emergency, by the pilot-cosmonaut. The programme of the first manned flight was calculated for one orbit around the Earth, but the construction and equipment of the spaceship-satellite will permit longer flights.

On completing the programme of flight before landing, orientation of the spaceship-satellite in a definite direction is effected by a special system. Then, at a given point of the orbit, the retro-engine operates, reducing the velocity of the spaceship by the required calculated amount. As a result, the spaceship transfers to a descent trajectory.

The cabin with the cosmonaut is braked by the atmosphere. Taking this into account, the descent trajectory is selected so that the g-forces during re-entry into the dense layers of the atmosphere do not exceed those acceptable for a man. After descending to a given height, the landing system switches in, and the actual landing of the pilot's cabin occurs at low speed. From the moment of switching-on the retro-engine to landing, the spaceship flies about 8,000km. The duration of flight on the descent phase is about 30min.

The external surface of the pilot's cabin is covered with a layer for thermal protection, preventing it from burning up during the descent phase into the dense layers of the atmosphere. In the walls of the cabin are three windows and two quick-opening hatches. The windows are equipped with heat-resisting glass and permit the cosmonaut to carry out observations during the entire flight.

The cosmonaut is located in the spaceship on an ejection seat, which is his working place in flight, and also enables him to escape in an emergency. The seat is installed in such a way that the g-forces during the launch and descent periods act on the cosmonaut in the most favourable direction (from chest to back). In the first flight the pilot-cosmonaut wore a protective suit. . . .

In the spaceship-satellite are also:—

(1) equipment essential for the life activities of the human organism (air-conditioning system, pressure-regulation system, food and water, system for the removal of products of life activities),

(2) equipment for supervision of the flight and a manual-control system for the spaceship (pilot's control panel, instrument panel, manual control unit, etc),

(3) landing systems,

(4) radio equipment for communication with the Earth,

(5) an automatic information-recording system covering the work of the instruments, radio-telemetry systems and various transducers,

(6) television system for observing the cosmonaut from the Earth,

(7) instruments for recording the physiological functions of the man,

(8) the retro-engine installation,

(9) equipment of the orientation system,

(10) equipment for control of the flight,

(11) radio systems for measuring the parameters of the orbit,

(12) heat-regulation system, and

(13) sources of electrical energy.

On the external surface of the spaceship are the organs of control, elements of orientation, heat-regulation system shutters, and radio antennas. The pilot's cabin is much more spacious than that of an aircraft. . . .

In the body of the pilot's seat are mounted the following:—

(a) separable back with attached system for restraining the pilot's body during ejection and parachute descent,

(b) parachute systems,

(c) ejection and pyrotechnical equipment,

(d) portable emergency supplies (food, water and kit) and communication and direction-finding radio equipment, which the cosmonaut can use after landing,

(e) system of ventilation of the protective suit and parachute oxygen equipment, and

(f) the automatic equipment of the chair.

Landing of the cosmonaut can be achieved in the cabin of the spaceship; such a method of landing was proved with the fourth and fifth Soviet spaceship-satellites, in the cabins of which were experimental animals. Also envisaged is the variant of landing by ejecting the cosmonaut and seat out of the cabin at a height of about 7km and subsequent landing by parachutes. This variant also has been proved with launches of spaceship-satellites. . . .

The instrument panel and pilot's control panel installed in the cabin are designed for the control of the operation of the basic systems on board, and to ensure, if needed, the descent of the spaceship by manual control.

On the instrument panel are a series of needle indicators and signal tableaux, electric clocks, and also a globe, the revolution of which is synchronized with the movement of the spaceship in its orbit. The globe allows the cosmonaut to determine his current location. On the pilot's control panel are handles and switches to control the operation of the radio-telephone system, the regulation of cabin temperature, and also to switch in manual control and the retro-engine.

For orienting the spaceship in the event of manual control, the cosmonaut uses an optical orientation device, allowing the position of the spaceship to be determined relative to the Earth. This device is installed in one of the windows of the pilot's cabin. It consists of two ring-shaped mirror-reflectors, a light-filter, and graticule glass. Light rays coming from the line of the horizon fall on the first reflector and pass through the glass of the window on to the second reflector, which directs them through the graticule glass into the eyes of the cosmonaut.

With correct orientation of the spaceship in relation to the vertical, the cosmonaut sees in his field of vision an image of the horizon in the form of a ring. Through the central part of the window the cosmonaut sees the part of the Earth's surface which is beneath him. The position of the longitudinal axis of the spaceship relative to the direction of flight is determined by observing the "run" of the Earth's surface in the field of view of the device.

Acting on the organs of control, the cosmonaut is able to turn the spaceship so that the line of the horizon appears in the orientation device in the form of a concentric ring, and the direction of "run" of the Earth's surface coincides with the course line of the graticule glass. This indicates the correct orientation of the spaceship. If necessary the field of vision of the device may be covered with a light filter or a small blind.

The globe installed on the instrument panel makes possible, as well as continuous location of the spaceship, advance determination of the place of its descent, with the switching-in of the retro-motor at a given moment of time.

Footnote. A revised timetable for the flight was included in the *Izvestia* article. This ran as follows:—

At 9.07 Moscow time on April 12 the spaceship satellite was launched.

At 9.51 the automatic orientation system was switched on. After the spaceship had emerged from the Earth's shadow this system sought out the Sun and orientated the spaceship on it.

At 9.52 Gagarin, passing over the region of Cape Horn, radioed that he was feeling well and the equipment was functioning normally.

At 10.15 the automatic programming unit commanded the initiation of the sequence in preparation for the switching-on of the retro-engine. At this time the spaceship was approaching Africa.

At 10.25 the retro-engine functioned and the spaceship began its descent trajectory.

At 10.35 the spaceship began to enter the dense layers of the Earth's atmosphere.

At 10.55 the spaceship landed in the predetermined region.

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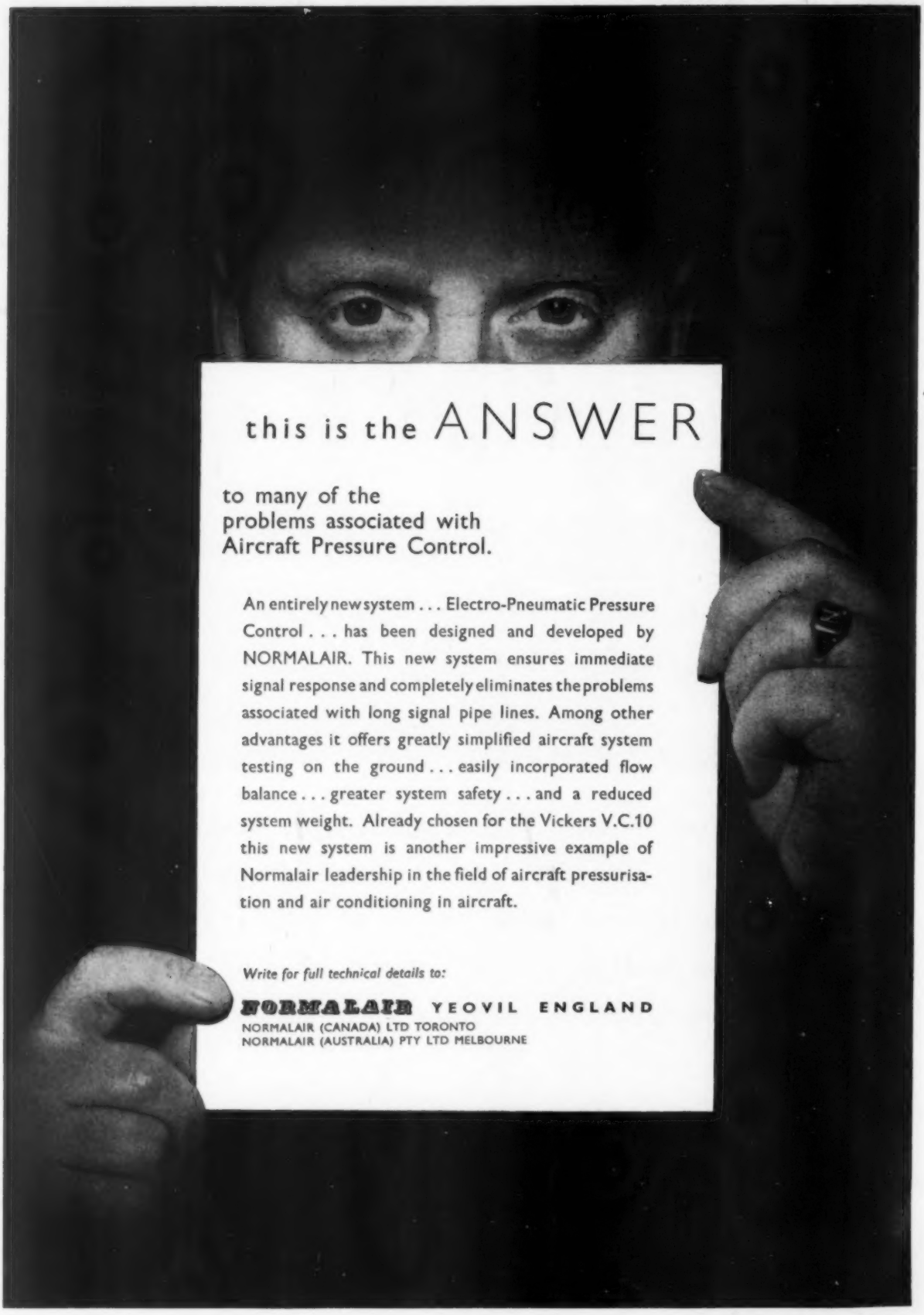
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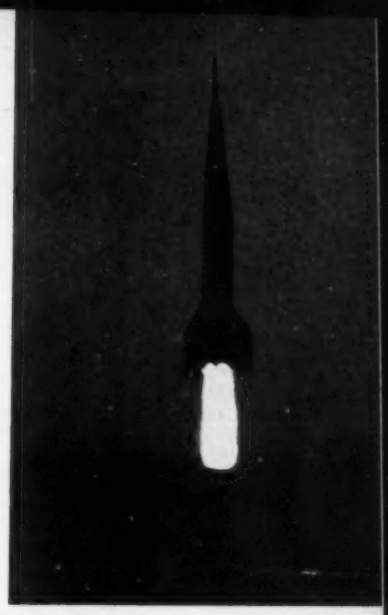
Missiles and Spaceflight . . .

SPACE SCIENCE IN FLORENCE

Part 2: Results from Rockets, Satellites and Tracking

By Kenneth Owen



This Soviet rocket appeared in a launch sequence in a film shown at the COSPAR symposium. The subject of the film was the second "spaceship satellite," launched on August 19, 1960, which carried dogs Belka and Strelka, but Prof Anatoly Blagonravov stated in a commentary to the film that this launch vehicle was not the one which had been used on that occasion

THE national reports presented on the first day of the COSPAR meeting and space science symposium at Florence, reported in last week's issue, were followed by four days in which scientific papers were presented by individual specialists. Sessions were devoted to radio and optical tracking, magnetic observations by rockets and satellites, telemetry and data recovery, "special events," recent results from instrumented satellites and spacecraft, international reference atmosphere, and scientific research by means of small sounding rockets. This article discusses a number of the major developments reported at the symposium.

The tracking of satellites, optically or by radio, is obviously an activity which is not confined to the two major satellite-launching nations, and the tracking papers at Florence came from many countries. In her introduction to the session on optical tracking, Prof Alla G. Masevich, of the Astronomical Council of the Soviet Academy of Sciences, noted that the world's optical-tracking teams included 96 in Russia, 110 in the United States, 80 in Japan, 24 in China, 18 in Holland, nine in Poland, seven in East Germany and five in Czechoslovakia. Although many interesting scientific studies had been made based on tracking data, much of the information obtained during the three-and-a-half years of tracking activity since the launch of Sputnik 1 had not yet been analysed and properly used.

The United States congratulates the Soviet Union. Outside the Palazzo Pitti on April 12, Dr Richard Porter (left), leader of the US delegation to the COSPAR symposium, shakes hands with Prof Blagonravov, chief Soviet delegate, after hearing news of the first manned orbital flight
"Flight" photograph

The accuracy of visual observations, Mrs Masevich pointed out, was generally limited by accuracy in timing. The best obtainable was a timing accuracy of 0.1sec, and in general the accuracy of visual tracking data did not exceed 0.2-0.3sec, which corresponded to 0.2-0.3° in position. This accuracy could be improved by using telescopes which followed automatically the satellite's motion, by taking into account the personal error of the observer, and—most effectively—by combining visual observations with photographic documentation.

The time had come to discuss seriously the problem of the most effective distribution of tracking stations over the globe, Prof Masevich suggested. In particular, there were insufficient stations in the southern hemisphere. Another suggestion was that the existing net of optical tracking stations should be used for the further study of related astronomical problems requiring statistical data, such as observations of meteor showers, occultations of stars by the Moon and planets, and "seeing conditions."

In photographic observations, as with optical observations, the timing accuracy lagged behind the accuracy of position determination. The highest photographic accuracy, the Russian professor stated, was achieved at present with the American Baker-Nunn cameras, and in many countries existing astronomical telescopes were used for photographic tracking. The optical tracking of space probes could be carried out only with the help of very large telescopes.

Examples of the high accuracy of Baker-Nunn cameras have included photographing the six-inch-diameter Vanguard 1 satellite at a distance of 3,000 miles and photographing the 26in Explorer 6 satellite at 14,000 miles, and details of these extremely accurate instruments were given in a paper *Experience in Precision Optical Tracking of Satellites for Geodesy* by George Veis and Fred L. Whipple of the Smithsonian Astrophysical Observatory. The Smithsonian optical tracking net consists of 12 Baker-Nunn cameras distributed around the Earth between latitudes 32°S and 36°N.

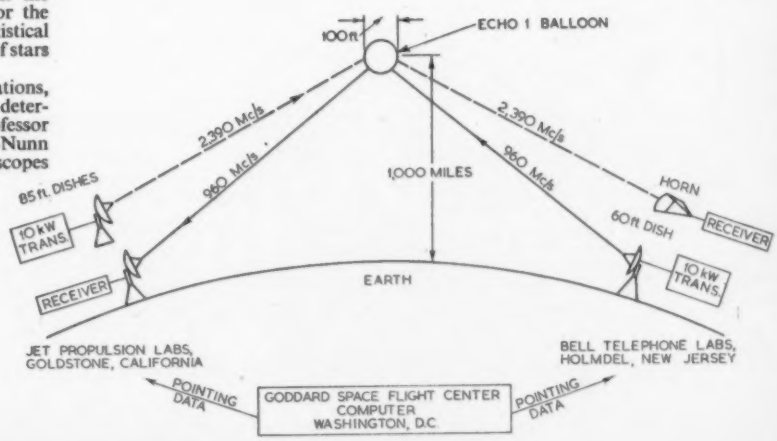
The Baker-Nunn camera, constructed by the Smithsonian Observatory specifically for the precise observation of artificial satellites, is based on a three-axis Super-Schmidt F/1 camera with a focal length of 50cm and a field of view of 5° × 30°. It can track along any great circle at a controllable rate, and can photograph satellites of the 12th magnitude. The focal field is spherical, and a 56mm film is used.

At a scale of 406″/mm the camera is capable of providing directions with an accuracy of ±2″. A time unit controlled by a crystal clock indicates the instant of the middle of the exposure to 0.0001sec. In practice, however, the timing accuracy is considered good at one-tenth of this.

The optical system of the camera was designed by James G. Baker and manufactured by the Perkin-Elmer Corp. The mechanical design was by Joseph Nunn and the cameras built by the Boller and Chivens Company. The first camera was put into operation in New Mexico in November 1957 and the twelfth in Hawaii in June 1958. Ten other cameras were constructed, located in Argentina, Australia, Curacao, Florida, India, Iran, Japan, Peru, South Africa and Spain.

Each station is equipped with a Baker-Nunn camera, a Norrman crystal clock and other auxiliary equipment for power regulation, film processing, film reduction and rapid communication. Most of the stations are staffed by six men, and the network is supported by a technical and administrative staff in Cambridge, Massachusetts.

It is unlikely, the authors suggest, that any satellite orbiting near Earth would exceed the range of the Baker-Nunn camera.



This diagram, showing the units involved in the Echo I experiment, was included in the paper "Tracking Echo I at the Bell Telephone Laboratories and Jet Propulsion Laboratories" by Mr William C. Jakes Jr of Bell Telephone and Mr Walter K. Victor of JPL

Director of the Radio Research Station, Slough, Mr J. A. Ratcliffe, is flanked by Dr A. P. Willmore (left) and Dr R. L. F. Boyd of University College, London "Flight" photograph

Missiles and Spaceflight . . .

In a paper *Tracking of Artificial Satellites in the USSR*, Prof Masevich stated that a network of 74 visual tracking stations attached to physics and mathematical departments of universities and teacher-training colleges in the Soviet Union is regularly observing Soviet and American satellites. From October 4, 1957, to April 1, 1961, more than 55,000 observations of Russian satellites and about 14,000 observations of American satellites had been obtained. During the same period about 40,000 observations from 33 foreign countries had been sent to the Soviet computing centre.

Visual observations at the Russian stations are carried out by means of Moonwatch telescopes (Type AT-1, 6 × 50, field of sight 11°) using equatorial co-ordinates, and by means of similar binoculars (Type TSK) for horizontal co-ordinates. Although the average accuracy did not exceed 0.2 to 0.3sec in time, stations with trained observers regularly obtained data correct to 0.1sec. At the Pulkovo Observatory and other stations a combined visual-photographic method was used which enabled positions to be determined to an accuracy up to 2min of arc.

Orbit predictions for Soviet satellites are sent by telegraph 2-3 days in advance to all participating stations. Orbit calculations are carried out at the Institute for Theoretical Astronomy in Leningrad. The reduction of observations usually takes 10 to 20 days, using a BESM electronic computer, and results are published in the *Bulletin of Soviet Tracking Stations*.

In addition to the visual tracking stations, there are 27 special stations used for photographic observations in the Soviet Union. These are equipped with NAFA 3 S/25 cameras with a Uran-9 lens (focal length 25cm, diameter 10cm, field of sight 30° × 50°) fitted with a special shutter. The shutter springs were strengthened in order to reduce the shutter opening and closing time to 0.0002-0.0003sec and so obtain sharp definition at the end of the satellite track. The accuracy with which positions are determined is 0.1min of arc. The results are reduced by means of an interpolation method evaluated at the Pulkovo Observatory.

During 1958-60 some 3,500 photographs were obtained. Although many astronomical observatories in the Soviet Union are equipped with telescopes suitable for photographing satellites fainter than the third magnitude, "they cannot be used immediately as none of them is supplied with shutters opening fast enough for precise time marking." Special devices have been developed at observatories in Alma Ata, Kazan, Pulkovo, Riga and elsewhere which give a timing accuracy up to 0.002sec.

Radio tracking stations have studied the propagation of radio waves in the ionosphere and have measured the Doppler effect, in addition to receiving regular signals from artificial satellites and space probes.

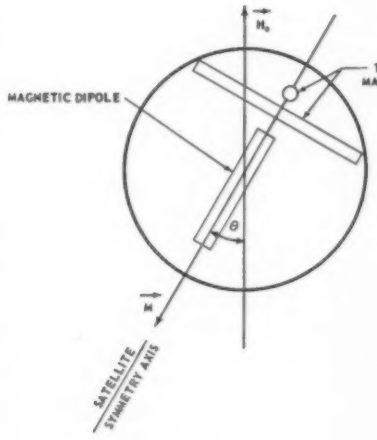
Other papers reporting detailed techniques for optical tracking included *Optical Tracking of Satellites Using a Rotating Camera*, in which Prof D. A. Richards of the Physics Department of the University College of Wales, Aberystwyth, described how the intensity of the photographic image of a satellite could be improved by rotating the camera at an angular velocity comparable to that of the satellite. In *Répérage des Temps et Réduction des Clichés selon les Méthodes employées a l'Observatoire de Meudon*, Dr P. Muller of Meudon Observatory described the use of an IBM 650 computer to convert "x, y" measurements from satellite photographs into equatorial co-ordinates using a number of known stars.

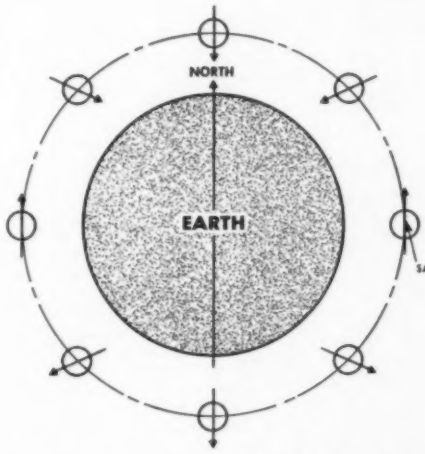
A photo-electric method of satellite tracking, and in particular an advanced version of equipment designed to utilise this method, was described in *The Development of a Photo-electric Satellite Tracker* by P. J. Bowen and A. C. Newton of the Physics Department of University College, London.

Radio tracking techniques and equipment were the subject of a number of papers, including *Radio Tracking of Satellite Vehicles* by Dr G. M. Truszynski of NASA, *Tracking Echo 1 at Bell Telephone Laboratories and Jet Propulsion Laboratories* by W. C. Jakes of Bell Telephone and W. K. Victor of JPL, and *Precision Radio Tracking of Space Vehicles* by E. B. Mullen and C. R. Woods of General Electric.

Systems of attitude stabilization for satellites based on aligning the satellite axis along the direction of the Earth's magnetic field, and along the direction of the gradient of the Earth's gravitational field, were described in *Magnetic and Gravity Attitude Stabilization of Earth Satellites* by Robert E. Fischell of the Johns Hopkins University Applied Physics Laboratory. Transit 1B and Transit 2A were magnetically oriented, and in addition the spin of Transit 2A was removed entirely by the use of highly permeable magnetic rods (see diagrams and photograph above).

Robert E. Fischell of Johns Hopkins University holds one of the nickel-iron de-spin rods of the Transit satellite



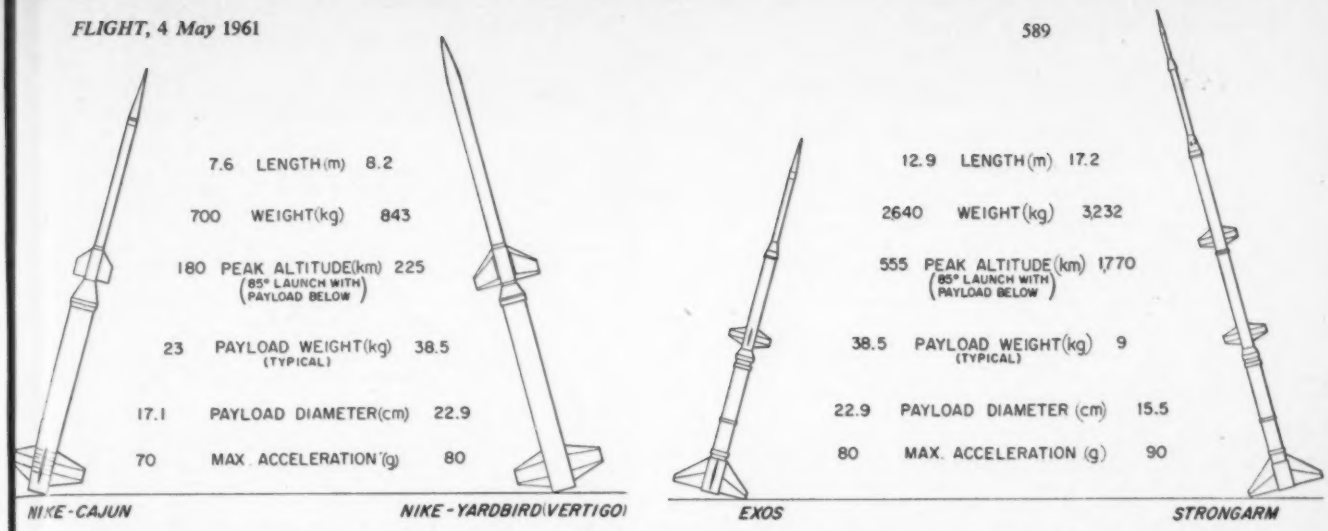


Left, satellite with magnetic dipole moment and magnetic damping rods; below, motion of a magnetically oriented satellite in a polar orbit (from "Magnetic and Gravity Attitude Stabilization of Earth Satellites" by Fischell)

Magnetic orientation is based on the principle that a satellite with a large magnetic dipole moment will tend to align itself, like a simple compass, along the local direction of the Earth's magnetic field. When spinning in the Earth's magnetic field, permeable rods develop eddy-current and hysteresis energy losses, so removing the satellite's spin energy.

A research satellite is currently being designed under the direction of Prof James Van Allen of the State University of Iowa, Mr Fischell disclosed, which would employ magnetic attitude stabilization to determine the directional properties of geomagnetically trapped radiation.

The field of research by means of sounding rockets was well covered at the symposium, and an excellent example of an inexpensive research-rocket programme was that given by Dr Leslie M. Jones of the High Altitude Engineering Laboratory, Department of Aeronautical and Astronautical Engineering of the



Two-stage, three-stage and five-stage solid-fuel sounding rockets (from "Upper Air Structure Measurements with Small Rockets" by Dr Leslie M. Jones of the University of Michigan). Nike-Yardbird is now in preparation by the Michigan group

University of Michigan, in his paper, *Upper Air Structure Measurements with Small Rockets*. Four of the vehicles mentioned by Dr Jones are illustrated here, and one of these, the two-stage Nike-Yardbird, is now being developed as a replacement for the Nike-Cajun. The new rocket, which should make its first flights later this month, will achieve heights up to 225km and will therefore overlap the perigee altitudes of a number of satellites.

The Michigan University group's work had led to four general conclusions:—

(a) The two-stage vehicles formed a middle group between the Aerobee (and other large and elaborate rockets) and the very small vehicles typified by Arcas. The larger rockets had the function of carrying new experiments and establishing first values, the middle group was useful in making limited surveys to establish average values and trends, and the very small rockets would then take over for synoptic firings in statistical numbers.

(b) The two-stage solid-propellant rockets—and to a surprising extent the three-stage and five-stage vehicles also—could be assembled and launched by the scientific group which built and operated the payload. Major launch facilities were not required.

(c) It had been shown that payloads originally weighing 70kg and designed for a 38cm diameter rocket could be reduced to 25kg and 15.2cm diameter. The high accelerations of the solid-fuel rockets, ranging up to 90g, had caused little difficulty in payload design, and nosecone heating had proved a serious problem only with those rockets which exceeded 500km peak altitude.

(d) By taking advantage of cheap available solid-propellant units developed for the Services, the cost of sounding rockets could be comparable to that of the other parts of an upper-air project. For a university-type operation the rocket vehicle, scientific instrumentation, launching and telemetering, and data reduction and analysis each accounted for about 25 per cent of the total cost of an experiment.

The first Italian launching of a sounding rocket was described by Prof Luigi Broglio, chairman of the Italian Committee for Space Research of the National Research Council, in the paper, *First Italian Experiment Using Sodium Cloud Technique*. This experiment represented the first phase of a programme to determine winds, temperatures and densities in the upper atmosphere, and was carried out in collaboration with the US National Aeronautics and Space Administration.

Prof Sir Harrie Massey (right) Chairman of the British National Committee on Space Research, with Mr. M. O. Robins, UK project manager for the first joint Anglo-American satellite
"Flight" photograph

The Italian side of the programme involved collaboration between the National Research Council and the Armed Forces Rocket and Missile Committee, and the initial launch had been directed by Prof Broglio with the assistance of a research group of Italian Air Force officers. The launch took place on January 12, 1961, from the range at Perdasdefogu, Sardinia. A Nike-Cajun rocket carried a sodium-cloud experiment to a maximum height of 150km, and photographic observations were made from seven stations in Sardinia and on the Italian mainland.

From the observations obtained, upper-atmosphere winds were determined over a useful height band. The Italian programme is to be continued with further experiments which will be synchronized with similar launchings by NASA from Wallops Island in order to obtain a more complete picture of the upper-atmosphere circulation.

Many of the scientific results reported at Florence referred to what are known as "special events" such as major solar flares. Although no event reported at the formal sessions was quite as special as that involving Maj Gagarin, news of which interrupted the symposium more than somewhat during mid-week, a spectacular effect on the atmospheric drag of satellites was measured at the time of the large solar flare of November 12, 1960.

Graphs shown by Dr Luigi G. Jacchia of the Smithsonian Astrophysical Observatory (*The Atmospheric Drag of Artificial Satellites during the November 1960 Events*) indicated a sharp peak in the drag curves for seven satellites, involving increases from twice to eight times the normal values, which coincided exactly with the period of the magnetic storm associated with the solar flare. The drag increase was more marked for the higher-altitude satellites.

One of the curves in Dr Jacchia's paper was based on work by G. V. Groves of University College, London, and this work was detailed in a symposium paper by Dr Groves entitled *Correlation of Upper Atmosphere Air Density with Geomagnetic Activity, November 1960*.

Another interesting aspect of the November solar flare was that Discoverer 17, launched shortly after the occurrence of this flare, when the radiation level above the atmosphere was several thousand times greater than the normal cosmic ray background, was able to bring back evidence of this radiation in photographic emulsion and metallic components in the recovered instrument capsule. This examination of the first objects to have been recovered after being subjected to this radiation was especially valuable,

Prof H. C. van de Hulst, COSPAR president (left); Dr J. Kaplan, University of California (second from right); and Prof M. Nicolet, CNRE, Brussels (right)
"Flight" photograph

Missiles and Spaceflight . . .

among other things, in helping to assess the radiation hazards of manned spaceflight.

Details of this were given in *Radiation Studies from Nuclear Emulsions and Metallic Components recovered from Polar Satellite Orbits* by Dr Herman Yagoda of the USAF Cambridge Research Laboratories, Hanscom Field, Bedford, Massachusetts. Information obtained from Discoverers 17 and 18 was compared, and was contrasted also with data from Explorer 7 and from balloon flights.

Although final conclusions have yet to be reached, the recovered emulsion blocks from the two satellites have been found to contain a wealth of information on galactic cosmic rays, trapped protons from the lowest fringes of the inner radiation belt, and what appears to be a heavy corpuscular component associated with the solar flare. Radiochemical analysis of the two capsules has indicated that the rate of production of radioactive isotopes tritium and argon-37 in Discoverer 17 was greatly in excess of that observed in the post-flare Discoverer 18. Iron components from Discoverer 17, for example, contained over 500 times more tritium than would be expected from the action of cosmic rays.

A film depicting the preparation for orbital flight of dogs Belka and Strelka was shown in connection with the paper *Some Results of Medical and Biological Investigations on Spaceship Satellites (1960-61)* by Dr D. G. Gazenko of the Soviet Union. The main item of interest in the film was the launch sequence from which the heading photograph on page 587 is taken, although Prof Blagonravov said in a commentary to the film that the rocket illustrated was "an old one" and not the one used in the August 19, 1960 launch.

Dr Gazenko's paper reported that the physiological reactions of the five dogs carried in the second, third and fourth "spaceship satellites" were generally similar. During the "active section" of the flight (the first 5min after launch), increases in pulse rate, respiration rate and arterial pressure did not exceed those "repeatedly achieved during table tests." After 90min, i.e. on the second orbit, all basic physiological indexes had returned to the pre-launch level.

Among the biological results, dry onion seeds sprouted twice as fast after a 24hr flight aboard the second spaceship satellite as did reference ones. But this stimulation was not necessarily caused only by the action of ionized radiation. More probable was the combined action of several factors, including vibration as well as radiation.

An improved method of determining upper-atmosphere density from the contraction of satellite orbits was described and applied to a total of 29 satellites in *Upper-atmosphere Density during the Years 1957-1961, determined from Satellite Orbits* by Mr D. G. King-Hele and Mrs D. M. C. Walker of the Royal Aircraft Establishment, Farnborough. The resulting picture of air density at heights from 180 to 700km showed the general decrease in density as sunspot activity declined between 1957 and 1961, and also a large day-to-night variation.

MERCURY-ATLAS SETBACK

An attempt to place in orbit an unmanned Project Mercury spacecraft by means of an Atlas booster from Cape Canaveral on April 25 was unsuccessful. Following an indication of a defect in the rocket, the Atlas was destroyed by command from the Cape 30sec after lift-off. The escape system by which the spacecraft itself is separated from the booster and returned to Earth by parachute apparently worked successfully.

DISCUSSING COMMUNICATIONS SATELLITES

The full lecture programme of the symposium on communications satellites to be held by the British Interplanetary Society on May 12 has been announced by the Society and is printed below. The symposium will be held in the council room of the Federation of British Industries at 21 Tothill Street, London SW1, beginning at 10 a.m., and there is a registration fee of one guinea for non-members of the BIS.

Engineering and Economics of Satellite Communication Systems, G. K. C. Pardoe, de Havilland Aircraft; *Operation and Economics of Preferred Communication Satellite Systems*, Dr E. K. Sandeman, English Electric Aviation; *Some Practical Problems of Satellite Communications*, Dr J. R. Pierce, Bell Telephone Laboratories; *Communications Satellite Systems suitable for Commonwealth Telecommunications*, Dr W. F. Hilton, Hawker-Siddeley Aviation; *The Synchronous Communication Satellite*, R. P. Haviland, General Electric; *Active Communications Satellites*, Dr G. E. Mueller, Space Technology Laboratories; *The Courier Satellite*, G. F. Senn and P. W. Siglin, US Army Signal Research and Development Laboratory; *Low-Cost Communications Satellites*, A. M. Peduzzi, aerospace consultant.

THE SCIENTIFIC VIEW

Speaking at the annual dinner of the Geological Society on April 26 in London, the Minister of Science, Lord Hailsham, said:

It is worthwhile remembering that the scientific prestige of a nation is ultimately won by choosing to do the things which are scientifically worthwhile.

This is the policy of the Government at the present time. We seek, and on the whole we take, the advice of the scientific world as expressed through the Advisory Council on Scientific Policy by the organs of scientific opinion, and on the whole I think we get better value for our money than any other industrial nation.

We are still handicapped by the defects of our scientific and technical education of the 1930s which has left us with an inadequate cadre of trained manpower, and an educational machine which does not yet match up to the demands of the present day. These are defects which must be constantly before our eyes, but which cannot be remedied overnight.

But they are defects we are rapidly overcoming; the fact that they exist makes it all the more imperative that we should take the right decisions and not waste scarce scientific manpower and resources on projects designed to make newspaper headlines rather than achieve solid results.

No doubt if our military experts had demanded and built a rocket capable of sending a nuclear warhead across the world, our scientists would now be pressing me to ask my colleagues for money to adapt it to play an independent part in the so-called space race as other nations with military rockets have done.

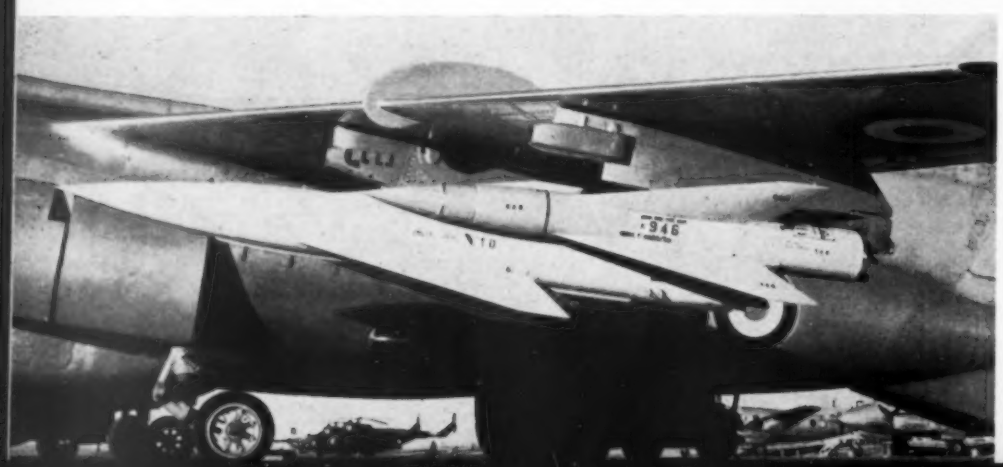
But as it is the scientists have advised us that to develop a rocket by ourselves solely for space research and civil science, though legitimate and desirable in a European context, is an unjustifiable use of manpower on a purely national scientific basis. I am bound to accept this judgment, and as long as I maintain the confidence of the scientific world in so doing I can afford to ignore uninstructed criticism.

On April 25 the Ministry of Defence announced that the Hebrides missile range is scheduled to be used by a Corporal battalion of the US Army for two weeks in June. This obviates their having to return to White Sands for firing practice.

An improved Pershing selective-range US Army ballistic missile, incorporating propellant with higher specific impulse, was fired 250 miles down the Atlantic Missile Range on April 21. This exceeds the previous best Pershing shot by 90 miles, and marked the 13th success in 15 firings.

The Air Ministry has awarded the building-construction main contract, worth £1.75m, for the Fylingdales BMEWS station to Holland & Hannen and Cubitts (Scotland) Ltd. Work on the three radar buildings and domestic and administration blocks is to start at once, and is to be completed by the end of June 1962.

Future underwater firings of Polaris missiles will not be announced by the US Navy, it was stated on April 14. During House testimony on that day it was conceded that eight out of the first 18 underwater launchings failed, the total score being: Polaris A-1, 48 land shots (29 successful, ten partials and one failure) and 18 announced underwater shots (ten successful and eight failures); Polaris A-2, eight land shots (six successful).



Many new details of the Nord AS.30 air-to-surface missile were given in our April 20 issue. The new weapon is here carried on the port inner pylon of a Vautour for firing trials at Colomb-Béchar, Sahara. On the outer pylon is an AA.20 (Type 5103 M2RT) air-to-air weapon, with a proximity fuze around the nose

SPORT AND BUSINESS

Private View

BY P.P.O.

"BY Guess or by God" was the title of a book written by a submarine captain of the First World War. If I remember aright, it described his navigation of the Dardanelles, submerged, in hostile waters and with only simple instruments. Right through the book ran the theme that although instruments and careful calculations are useful, they are no substitute for commonsense, experience, and the sort of sixth sense which can only come with time and being in tune with your surroundings.

The second-stage private pilot could find a lot to learn from this book. By second-stage, I mean the private pilot who has learnt to handle his aircraft reasonably well, and who has gained enough confidence in his navigation and map reading to fly across country in good visibility. He now wants to enter the second stage, that is, to gain the ability to fly and find his way in poor visibility, provided he can see the ground.

I have come across lots of pilots who are thoroughly well book-trained, and know all about compasses and the triangle of velocities, but who would be guaranteed to lose their way in any flight over 100 miles with visibility less than a mile or two. And these pilots are a danger to themselves and their passengers, and can be a nuisance to everybody.

There are wireless masts and factory chimneys galore these days which can be a great menace if you are flying a little low, so don't spend too long staring at your compass and map; keep a good look-out ahead.

It is easy to fly over high ground without noticing it, so get into the habit of estimating your height by eye as well as by altimeter. All cows are very nearly the same size and you can soon judge what a cow looks like from 500ft.

Remember that wind strength and direction tend to vary, and may be quite different to the estimate you made on your triangle of velocities. On the other hand, railways have been there a long time and their direction can easily be checked by flying along them. Also, it is easy to see the difference between main and branch lines. If you are really lost, fly up and down what you know is a safe stretch of the first railway you come to, while you spend time looking at your map and checking the direction of the lines on your compass. A bend in the line, a road or river crossing, or a branch line will certainly enable you to identify your exact position. After that, stick to known features on your map and don't get lost again.

Doing a Bradshaw was a common method of flying before the war. It was used during the war by enemy pilots finding their way to big towns, and it is still the best and safest way of flying in bad weather. Railway engineers normally choose the valleys for their routes. If the weather gets just too bad, you can always execute a 180° turn with the railway in sight, and return the way you have come. And if the worst comes to the worst and you have to land in a field, maybe you will be somewhere near a station.

The old habit of flying low enough to read the name of the station is no longer recommended. Since the railways were nationalized, the names are not so clear, and the station masters, now Civil Servants, are more likely to be unpleasant. In any case, it is not really necessary; you can always identify the bit of line you are following from the map, and frightening train passengers is bad form. Poor things, they have enough to put up with already.

The standard half-million map is a remarkable document insofar as the ground features are drawn on it with almost the exact emphasis with which you will notice them from the air. If a road is shown you will be able to identify it. A river or a wood are clearly marked and the shape is always exactly right. The shape of a wood is a most distinctive feature and will give certain identification. Unfortunately, they don't mark factory chimneys, radio masts, or power cables, so keep a good look-out ahead, glancing at your compass and map only occasionally. The "head in the office" pilot is certain to come to a sticky end, as even airline pilots have discovered. And to rely solely on instruments when God has given us two good eyes is nearly criminal and certainly blasphemous.

"The old habit of flying low enough to read the name of the station is no longer recommended"

Lastly, try to get into the way of keeping a compass in your head, like a bird does. It is not at all impossible. Sunlight, wind, the shape of trees, the way the cows are standing, the ripples on water, shadows, all take on a pattern which you can get to know and which will give you a clue as to which way you are heading. Not that your compass is likely to fail you, but it is easy to muddle a reciprocal course in times of stress.

Many times, especially in flying over sea in poor visibility, I have begun to get that horrid feeling that the compass must be wrong. I feel sure I have turned. Trust the DI, the turn-and-bank, and the radio compass if you can afford them, but it is comforting to observe that the ripples on the water and the marks of the tide indicate that you are heading in the right direction for land, and they are sometimes a valuable check on the course you think you are steering.

To sum up, the compass, whether it be magnetic or gyro, is the pilot's best friend, but eyes, his experience, and his commonsense should never be neglected or ignored.

★ ★ ★

Details of the Tiger Club aerobatic competitions for 1961 have now been published. They consist of two competitions, one for British pilots with under 250 hours, and another open to all, each designed to encourage young pilots to have a go at this most fascinating and demanding art.

To be a good aerobatic pilot you have to be fit, fearless, have good hands and a mature judgment of time, motion, and risks, all of them good things in themselves. Admittedly, aerobatics nowadays seem to have lost the practical military value for combat which made them so important in days gone by. On the Continent a good aerobatic pilot still can and does earn a reasonable living by entertaining the crowd, and it is possible that the same opportunities will occur in this country. He or she seems also to be the material from which good test pilots may be made. The Lockheed Trophy contest which is held annually at Coventry attracts the best of the Continental pilots, and it is the Tiger Club's aim to keep the art alive in Britain.

THE VICTA R-2 FOUR-SEATER, the prototype of which made its first flight at RAN Station, Schofields, NSW, on February 15, has been temporarily shelved, an Australian correspondent reports, and the Aviation Division of Victa Consolidated Industries has been reorganized. Mr R. C. Kerville, who was in charge of the Division, left the organization in late March, and has been succeeded by Mr F. Henstock, formerly assistant to the general manager. Mr Luigi Pellarini, designer of the R-2, also has left Victa and is now in New Zealand working on a crop-spraying aircraft. The R-2 may be abandoned in favour of a four-seat development of the Air Tourer, to be designed by Mr Henry Millicer, the Air Tourer designer. This would have many parts in common with the smaller machine, and would be much cheaper to produce.

The production-line "prototype" Air Tourer with 95 h.p. Continental and all-metal airframe will make its first flight in August, and the company hopes to secure a C of A about October. Production of 50 aircraft in the first year is planned. Victa has abandoned previous plans for foreign sales and will not show the aircraft at any overseas show. It is understood that the Air Tourer price, with radio, will be about £A3,600, compared with an estimated £A3,000 for the Morane Rallye, which is being marketed here in Australia by de Havilland. The first Rallye will be seen here in June. The high-wing Piper Colt is now carrying out C of A. trials at Archerfield, near Brisbane. Piper is making a big sales effort,

Currently the subject of distributorship discussions between Shinn Engineering Inc of Santa Ana, California, and several British companies is the Shinn 2150-A two-seater, formerly known as the Morrisey 2150. Powered by a 150 h.p. Lycoming, the type cruises at 135 m.p.h. at a gross weight of 1,817lb, and has a basic price of $8,950

SPORT AND BUSINESS...

but the high-wing configuration is not liked by the clubs. The Colt may nevertheless be a success in Australia because of the possibility of quick delivery.

The only firm order for the Air Tourer so far is for three for the Royal Aero Club of New South Wales. All other "orders" are letters of intent. It is understood that, following a demonstration tour by the original prototype of the Air Tourer, which is partly of wooden construction, the Auckland Aero Club suspended its letter-of-intent and will await the all-metal model before finally deciding.

AS FROM APRIL 17 a short-crossing corridor has been established across the Channel between England and France for the benefit of private and light aircraft (UK Notam 194/61, Belgian 11/61 and French 3218/61 refer). Eastbound flights to France will be from Lympne to Ambleteuse, via the Varne light-vessel. Westbound flights will be from St Inglevert to a point 2 n.m. east of Folkestone. These tracks will provide 5 n.m. separation for opposite-direction traffic. Available altitudes are 1,000ft or above 3,000ft.

The French Notam, significantly, does not mention this route but refers the reader to the French Aeronautical Information Publication in which are listed certain routes which must be followed by private aircraft effecting a VFR Channel crossing. They are then required to file flight plans, carry radio and report at certain positions. The AIP does not make it clear that this directive is based on a much earlier piece of French legislation (Arrête of September 22, 1958) which states that these procedures will have to be followed by aircraft which fly out to sea to a distance which exceeds either the distance from which they can reach land in case of engine failure, or 15 times the altitude of the aircraft, whichever is the shorter.

Also in French legislation (Decrét No 57.598 of May 13, 1957) is the provision that such regulations only apply to the airspace controlled by the French authorities. Thus, the recent action on the part of French controllers of refusing permission for British pilots of non-radio aircraft to take off from Calais has been unjustified. (The FIR boundary lies only a few miles off the coast.) Provided that they can attain an altitude greater than the specified minimum, light-aircraft pilots are perfectly free to make a Channel crossing without radio.

Mr R. Campbell and Miss Pamela Klein have joined W. H. & J. Rogers (Engineers) Ltd, Cessna agents for East Anglia and the Midlands, as pilots. They will give Cessna demonstrations and will instruct at the Bedfordshire Air Centre, Cranfield (see news-item in column 2)

INTENDING CONSTRUCTORS can now buy full sets of working drawings of the ultra-light monoplane designed by John Taylor. This aircraft, designed and built as a spare-time project, is the first postwar British light aircraft for which amateur-construction plans are available. Each set consists of a dozen drawings, together with a number of explanatory photographs of the structure, and costs £7. Drawings are obtainable from the designer at 46 Sunnyside Road, Ilford, Essex. Several sets have already been sold to customers in the United States, Canada and Australia.

Whereas the prototype is powered by a JAP twin-cylinder horizontally opposed engine, foreign constructors will find an excellent substitute in the Aeronca E.113 unit. The JAP engine is basically a British version of the American design. It would also be possible to fit any of the modified Volkswagen engines, although this would probably result in a lower performance.

Development of various details of the design continues. The photograph below, obtained over the Easter weekend, shows the designer flying the aircraft without its bubble canopy. It has been found that the cockpit is exceptionally well protected from the slipstream, and it is intended to replace the rear screen with a faired headrest.

Performance on the nominal 38 h.p. of the JAP engine driving a modified Flöttorp airscrew is good. A maximum level speed of 90kt is obtained and a comfortable cruising speed is 80kt. Gross weight is 610 lb and the range with a full tank is approximately 250 miles. Stalling speed with flaps up is 35kt; this reduces to 29kt with flaps down, and the gliding angle with full flap is very steep. Initial rate of climb is 950ft/min.

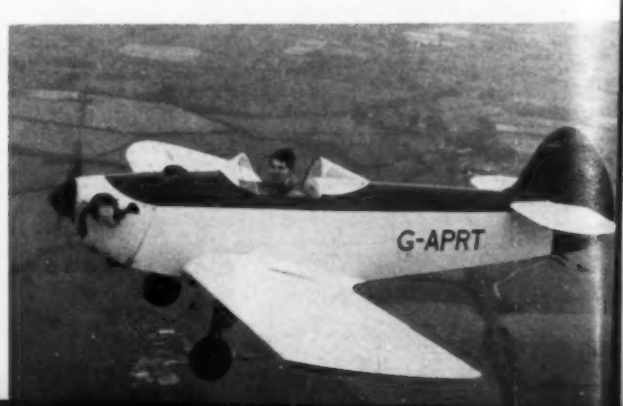
THE BEDFORDSHIRE AIR CENTRE is to be opened on June 17 at the aerodrome of the College of Aeronautics, Cranfield. Chairman of the centre will be Mr Neville Rogers of W. H. and J. Rogers (Engineers) Ltd, Great Barford, the Cessna agents for East Anglia and the Midlands, and Mr A. J. McDonald is secretary. As indicated in a photograph at the foot of this page, the Rogers organization has recently appointed additional pilots to assist in both demonstration flying and instruction work. The initial fleet of the air centre is expected to be two Austers, two Cessnas and a Tiger Moth.

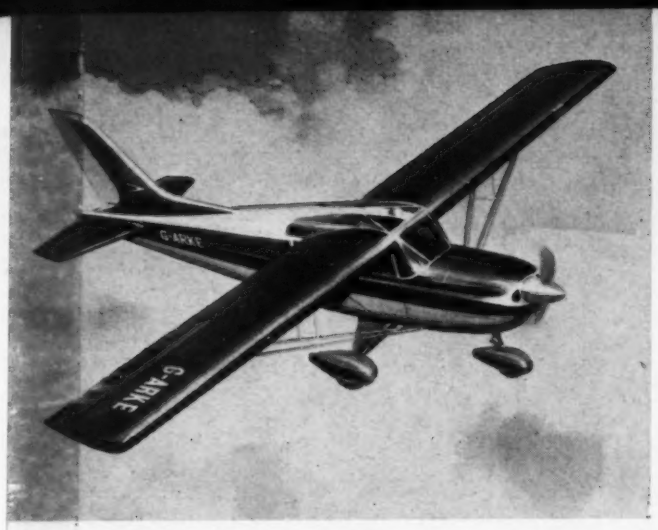
OPEN NATIONAL CHAMPIONSHIPS in parachuting are to be held at Stapleford Aerodrome, Essex, during the weekend of May 6-7. Organized by the recently formed British Parachuting Association, the contest is expected to attract entrants from 17 clubs in this country and abroad. Chief judge at the meeting will be Maj T. W. Willans.

McALPINE AVIATION of Luton have been appointed sole distributors in the United Kingdom for Helio Aircraft Corporation. The first of two Helio Courier aircraft ordered by McAlpine was expected to be among the aircraft on show at last weekend's Shackleton Aviation Weekend at Baginton. This Courier was flown from Boston to London Airport inside a BOAC DC-7 freighter, and will be used by the McAlpine company for executive transport between construction sites and also for demonstration work.

NORFOLK AND NORWICH AERO CLUB are organizing an Open Day at Swanton Morley Aerodrome on June 25. Visiting aircraft are invited to arrive between 9 a.m. and 1 p.m., and further details are available from the club at St Giles Street, Norwich.

The Taylor monoplane, powered by a 38 h.p. JAP engine, has a cruising speed of 92 m.p.h. at a gross weight of 610lb. As reported in a news-item on this page, plans suitable for the amateur construction of this machine are now available from the designer, John Taylor





AIREDALE UNLEASHED

First Pup from the BEAGLE Litter

LATE on Sunday, April 16, with its navigation lights on, the Beagle-Auster Airedale, first of the new British range of light aircraft, became airborne from Rearsby, Leicestershire. This was just four hectic months and ten days after work was started on the first design drawing. Light had faded, and no photograph could be taken to record the event; but the date should be remembered long after the conditions under which the first flight was made have been forgotten.

No release of information previous to the following description has been made about any of the new series of aircraft which are to be produced by British Executive and General Aviation Ltd. The A109 Airedale—which was to make its début at Coventry last Friday, April 27, on the first day of the Shackleton sales weekend—is the first of a high-wing range "by Beagle out of Auster", as the process of design stimulus is described by Beagle's managing director, Mr Peter Masefield. The Airedale represents both a continuation of, and a breakaway from, previous Auster practice. Its Beagle companions, which again may not be announced until the prototypes are ready to fly, will be the Masefield-Beagle executive types and the Beagle-Miles low-wing designs. A companion to the Airedale, also just announced, is the Beagle-Auster A61 Terrier, a civil version of the Auster 6 in service with the British Army.

Designated A109, the Airedale is the one hundred and ninth Auster design variant since the original British Taylorcraft of 1938. Under the Beagle scheme of numbering, the first digit indicates the number of engines and the final digits the serial number of the aircraft. The Airedale thus indicates, in its type number, its association with earlier designs in the Auster range, while being also the forerunner of more developed high-wing aircraft in the series.

Fundamentally, the task of the Airedale's designers, under Mr Masefield's direction, was to begin to restore Britain's place in world markets as a constructor of light and business aircraft; and, against mounting competition, considerable urgency has attended every stage of design and construction. In conceiving the Airedale, it was decided not to abandon Auster methods of construction, since the development of monocoque techniques would have involved a delay that could ill be afforded. In any case, the traditional welded steel-tube fuselage and fabric-covered wing is strong, trouble-free and easily repaired. Moreover, Beagle-Auster have consequently been able to use modified Auster jigs, to construct an attractive and much-modernized design from which the perennial Auster shortcomings should largely have been eliminated. The Airedale is faster on its 180 h.p. Lycoming than is the similarly powered D.6, yet has a short-field performance equally as good. At £4,750 in standard form, it is among the cheapest four-seaters at present on sale in Great Britain. Designed to meet both British BCAR and US CAR.3 requirements, it should also be among the strongest. Six aircraft were sold to W. S. Shackleton (Aviation) Ltd on the day that the order book opened.

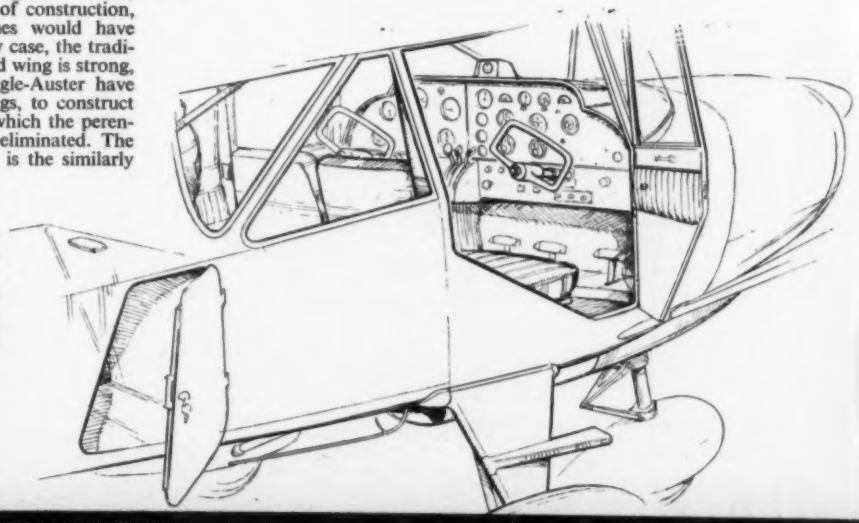
Structure Typical of the transformation of Auster design under Beagle aegis is the Airedale wing. Broadly similar to the basic 36ft span Auster wing, and retaining the same NACA 23012 section, it is in fact entirely new in both geometry and detail. Extruded L.65 double-T section spars are larger than in the D series, and about 25 per cent stronger. The aileron shroud has been extended to the wing root, and a new, slotted flap has been added inboard of the long-nose aileron; both flap and aileron are of metal construction, fabric covered, and of similar profile. The aileron has a revised tip section with a square end, and both aileron and flap are hung on two, rather than three, hinges.

At the wing root, the welded-steel end rib has been abandoned for a built-up light alloy design, and the tank bay has been redesigned to take a 16 gal (19.2 US gal) light-alloy (previously steel) fuel tank. A diagonal bracing strut from the front wing-attachment point passes through a tube welded into the tank. Outboard of the main tank bay is accommodation for an optional 10gal tank—which, if specified, would be fitted before the wing is fabric covered. This outer tank bay is braced with diagonal tie-rods, as are all other bays out to the tip. A new glass-fibre tip, Beagle-Auster manufactured, enhances the appearance of the wing and accommodates flush navigation lights.

Wing weight has been saved by using light-alloy forgings or machined fittings everywhere except for the lift-strut attachments, which are of steel and buried in the wing. An innovation is the SafeFlite stall-warning indicator in the starboard wing leading edge. A pitot beneath the port wing is electrically heated. Heating is standard, as is a landing light comprising a pair of 100W sealed-beam units in the leading edge of the port wing. The static vent is in the fuselage.

Although the basic Auster welded-steel tube fuselage has been retained, the rear end has been greatly modified to accommodate changes brought about by moving the elevator hinge-line 22in aft and sweeping back the fin. The old fin-post has disappeared, and a tapering flat platform carries the tailplane. At the front of the fuselage, the firewall is formed from an L72 sheet bonded to a Durestos insulating and fire resistant panel.

Entirely new are the door arrangements, which in earlier Austers have been a source of criticism. The Airedale has a forward door on the starboard side only, but an additional door giving access to the rear seats has been contrived within the scantlings of the basic welded-steel-tube framework. To improve access to the cabin, the lift struts have been swept forward to pick up on the forward door post, and cabin width has been increased by revising the external shape of the fuselage. Carrying additional loads through the top of the fuselage has allowed the cross-bracing tubes in the cabin area to be greatly simplified, and visibility has been improved. The wind-



One of the most obvious advantages of the Beagle-Auster Airedale is the way in which access to both front and rear seats has been improved in comparison with that of earlier Auster types. The pilot must climb in before the passenger, but this arrangement allows a change of passengers to be made while the engine is running. A luggage bay is a new feature and all doors can be locked

AIREDALE UNLEASHED . . .

screen is standard Auster, but the side windows have been revised and two additional roof lights have been added above the rear cabin. In production aircraft there will be a hinged d.v. panel in the fixed forward window.

The undercarriage shock-truss under the front seats has also been simplified. A new, one-piece metal front floor is riveted into position and, for the first time in an Auster-built aircraft, the front seats run on tracks and nylon rollers and are adjustable over a range of 4in. Welded-steel seat frames are upholstered with webbing and have polyurethane cushions. The rear seats, also built up from steel tube, are anchored to a rear floorboard surfaced with ¼in-thick ply. On the starboard side a forward-opening door gives access to a luggage bay. Built up from a wrapped sheet of L.72, it can accommodate 50lb of baggage.

From the firewall to a line aft of the rear door, the fuselage is metal skinned, L.72 sheets being flush-riveted to light-alloy formers attached to the tubular framework. Both the rear-cabin roof and the fuselage forward belly are also metal-clad, but the door-surrounds are moulded from glass-fibre. Aft of the cabin a non-structural framework of formers and stringers carries a fabric covering. A chine stringer runs below the windows and tapers into the tailcone, witch's-hat stringers form a radius around each top longeron, and other stringers support the fabric in way of the lower corners. There are further stringers along the top and bottom centre-line.

Front and rear fuselage doors comprise outer and inner pressings welded together, the upper framework being formed from half-inch square light-alloy tube. All doors have flush catches and key locks.

The Beagle Tail

An Auster Mk 9 all-metal tailplane has been modified for use on the Airedale, picking up at four points on the fuselage framework. The elevators are new units, of metal construction, fabric-covered, and carry a trim-tab each side. The swept fin, of NACA 009 section, is entirely new, and its characteristic shape is to be repeated in every aircraft in the Beagle range. Built up from pressed spars and ribs supporting a flush-riveted metal skin, the front spar is pin-jointed to the fuselage framework and the rear spar picks up on the tailplane. Extensive use is made of glass-fibre in the tail area. The fin leading edge and dorsal fin is a one-piece moulding of this material, and glass-fibre is used for elevator and rudder tips, in which the mass balances are concealed. A three-piece glass-fibre tailcone bolts to formers on the fuselage structure. Unlike previous Auster designs, the whole tail unit can be fitted after the fuselage has been fabric covered.

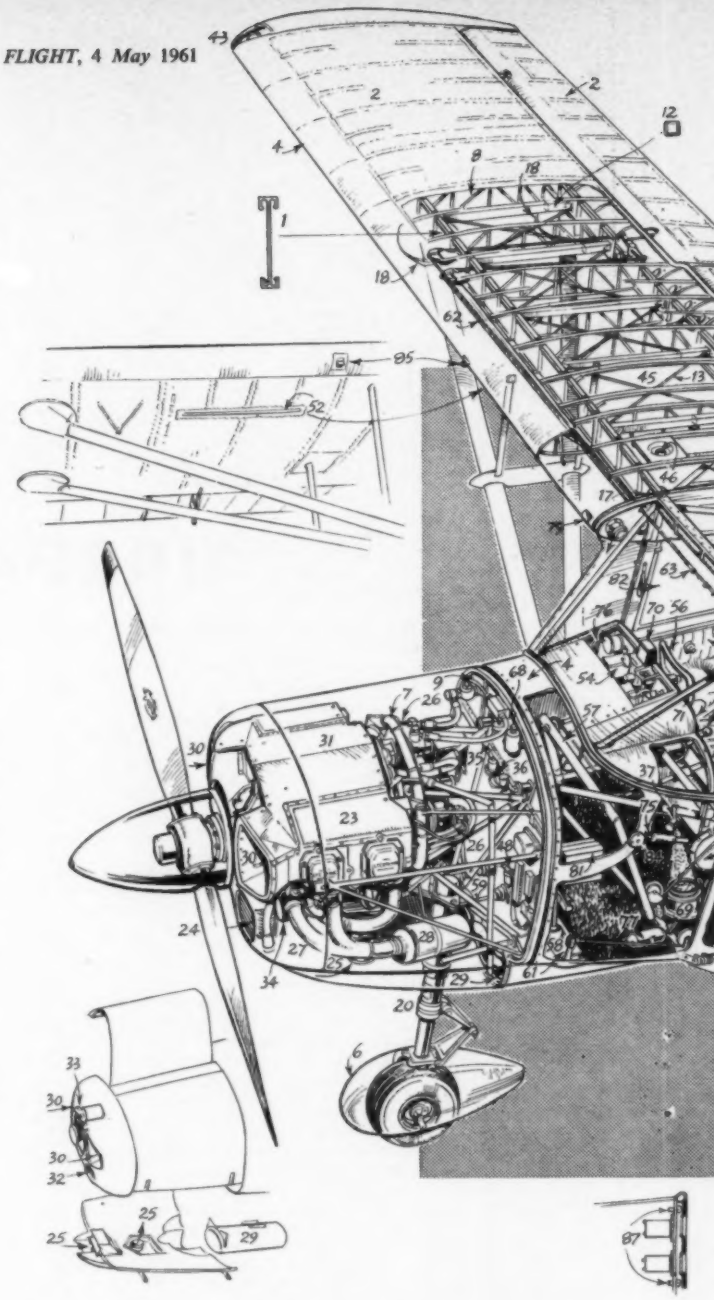
Undercarriage Auster practice is followed for the bungee-sprung main wheels, but Woodhead-Munroe double-acting shock absorbers are used as ride dampers. An improvement over earlier designs is that the bungees can now be bench-assembled. The main undercarriage legs carry Dunlop 17.5in wheels, equipped with tubeless tyres and hydraulic disc brakes operated from a single lever in the cockpit.

The nosewheel—the first to be used on an Auster-built aircraft since the prototype Atlantic—is supported by a welded-steel tubular structure bolted to the main engine-mounting pick-ups. Top and bottom bearings of the Lockheed nose oleo are carried in steel collars spaced by a light-alloy tube. A Dunlop 14in wheel is cantilever mounted, and the leg is steered by arms directly connected to the rudder pedals. All wheels are covered with glass-fibre spats of Beagle-Auster manufacture, that at the front being split laterally for ease of assembly. There is a towing attachment on the nose leg.

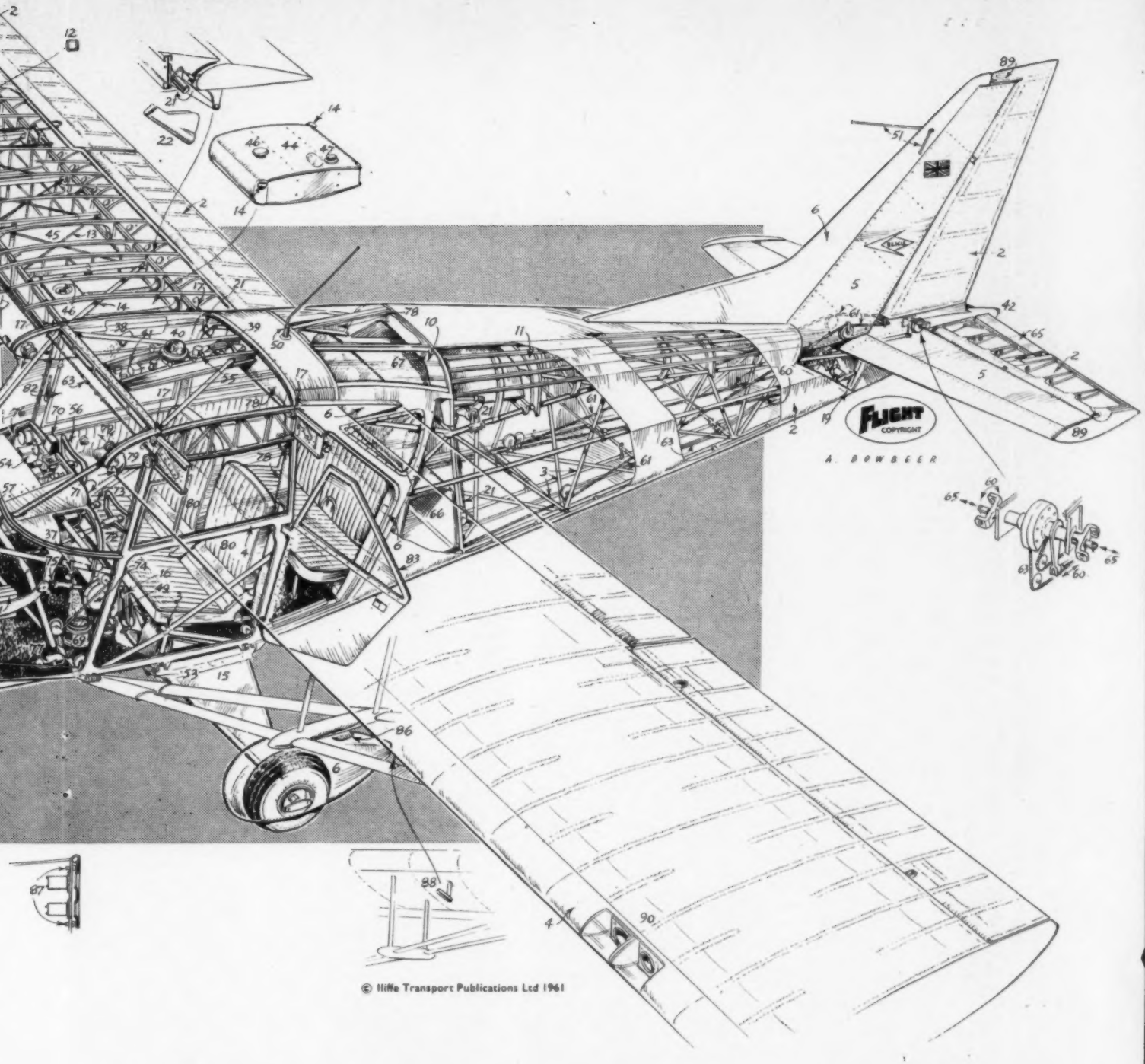
Engine installation Powerplant of the first production Airedales will be the four-cylinder, horizontally opposed Lycoming O-360-A1A, driving a 74in constant-speed MaCauley variable-pitch propeller with a Woodward constant-speed governor and a glass-fibre spinner of considerable length. An unusual feature of the installation is the cross-over exhaust system embodying two separate silencers, from which short tailpipes protrude into the ejector exhaust. Developed from the unit fitted to the Auster Agricola, the ejector comprises a stainless-steel tube outside a perforated light-alloy housing, the whole being shrouded by a light-alloy fairing.

All cowl panels are carried from a ring bolted to the engine, there being no direct attachment of the cowling to the airframe. Each side panel is hinged from the upper central brace supporting the nose cowl, and is secured by a pair of toggle fasteners to the fixed undershield and exhaust fairing. Carburetter air is drawn in through an aperture in the nose cowl, and passed through a Vokes filter on which a shutter provides for an intake of either warm or cold air. Engine and propeller controls in the cockpit are of the quadrant type, moving in a box centrally mounted on the instrument-panel cross-tube. Friction is pre-set, and no adjustment is provided.

[*continued on page 596*]



1 Extruded L.65 alloy spars
2 Fabric covering
3 Welded tube primary structure
4 Light-alloy skin
5 All-metal fin and tailplane
6 Glass-fibre mouldings
7 Tubular engine mounting
8 Light-alloy ribs and riblets
9 Firewall
10 Perspex (⅛in thick) all round
11 Light alloy sub-frames
12 Tubular drag-members
13 Diagonal bracing
14 Tank-bay bracing-tube through tank
15 Tubular undercarriage legs, fabric covered
16 Woodhead-Munroe hydraulic shock-absorbers and bungee cords
17 Single-point spar/fuselage joint
18 Light-alloy cuff around strut-end
19 Frame strengthened for tail-bumping
20 Lockheed steerable nosewheel leg
21 Cable, push-rod and torque tube to slotted flaps
22 Flap hinge-bracket fairing
23 180 h.p. Lycoming O-360-A1A flat-four engine
24 6ft 2in MaCauley c.s. propeller
25 Intake to updraught carburetter
26 Magnetos
27 Cross-over exhaust system
28 Silencers
29 Ejector exhaust tunnel
30 Cooling-air intake
31 Cooling baffle-box
32 Oil-cooler intake



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33 Belt-driven 35A generator
34 Starter motor
35 35Ah Rebat Executive battery
36 Relay and starter-solenoid
37 Compass light
38 Instrument panel floodlight
39 Roof light (microswitch on doors)
40 Grimes rotating beacon
41 Magneto and master switches
42 Grimes tail light
43 British standard wing lights
44 16 Imp gal light alloy tank
45 Long-range tank bay (10 Imp gal each side)
46 Filler
47 Contents unit
48 Fuel filter
49 Fuel selector cock
50 VHF aerial
51 VOR/ILS aerial
52 Glide-slope aerial taped to skin
53 Marker aerial under belly (see detail sketch)
54 Radio sets behind panel: Motorola 5611c and 5640o VHF T/R; Motorola VOR/ILS, glide-slope and marker-beacon receiver
55 Roof-mounted loudspeaker (optional)
56 Control wheels
57 Elevator/aileron yoke
58 Rudder pedals
59 Steering links from 58
60 Elevator cables and pushrods
61 Rudder cables
62 Aileron cables
63 Aileron balance cables
64 Trim cables and chains
65 Trim-tabs and pushrods
66 Luggage bay (door starboard)
67 Shelf
68 Wheel brakes hydraulic header-tank
69 P6 Magnetic compass
70 Lindolph FK16 stand-by compass
71 Full blind-flying panel (optional)
72 Cigar-lighter on panel, four ash-trays in cabin
73 Throttle (quadrant-type), mixture, pitch
74 Elevator trim-wheel
75 Flap lever
76 Instruments access
77 Fire extinguisher
78 Preformed plastic coverings
79 Cockpit cool-air louvres (integral air temperature gauge starboard)
80 Folding seat-backs
81 Radio modulator box
82 Front door (starboard only)
83 Rear door (port only)
84 Static air vent
85 SafeFlite stall-warning indicator
86 Step-plate on spat
87 Indirect panel-lighting behind facia
88 Avimo electrically heated pitot
89 Mass balances
90 General Electric BV 100W landing lamps

A passenger door on the port side and a fully upholstered rear compartment make the Airedale a full four-seater. Fuel for about 950 still-air miles, and the full baggage allowance of 50lb, can be carried with all seats occupied

AIREDALE UNLEASHED . . .

Systems Dual controls are fitted to special order only, the standard single handwheel actuating a revised Auster-type yoke hinged from the fuselage sides. Aileron and elevator circuits both follow Auster practice, but the elevator cable is connected to a relay shaft in the rear fuselage. This operates a push-pull rod coupled to a lever on the underside of the elevator. The rudder is cable-operated throughout its length from Auster pedals moved 11in further forward than in previous designs. No foot-brakes are fitted, the pull-out hand-brake centrally placed under the instrument panel operating directly on to a Dunlop master cylinder. The lever is rotated through 90° for the parking position.

Two systems which have been completely revised on the Airedale are trim and flap actuation. Trim is now adjusted by a centrally mounted wheel just forward of the front seat. Full range is covered in 1¼ turns, and actuation is by a continuous 18 s.w.g. piano wire operating an irreversible screwjack on the elevator hinge-line. The tabs are operated through rods and bell-crank links.

After many years, the overhead flap-actuating lever in the wing root has been abandoned in favour of a central lever on the floor. Actuating cables pass under the rear floor and up the aft cabin bulkhead, to a cross-shaft in the cabin roof. From this point cantilever levers and push-pull rods rotate the flap torque-shaft. Flaps deflect through 15° for take-off and 40° for landing. An Auster-type lever is used in which the handle is pulled forward to release the ratchet pawl.

Other controls and instruments reflect the Beagle philosophy that a complete overhaul of previously accepted British standards was necessary in order that their aircraft could compete successfully in overseas markets—or, for that matter, at home, where some 50 imported aircraft types are now available.

The instrument panel is divided into an upper and lower section by a cross member bracing the cockpit sides. Only a venturi-operated turn-and-bank is standard, but a full blind-flying panel may be specified for installation in the panel space facing the pilot, all instruments then being driven by an engine-mounted vacuum pump. Engine instruments are centrally mounted, the face of the recording tachometer being so arranged that the needle is vertical at normal cruise power. Provision for radio and navigation equipment up to full airline standard is made on the panel space in front of the second seat. A Smiths Motorola 190-channel transceiver, with VOR and glide-slope facility, is likely to be the standard Airedale radio, supplied at extra cost. It is anticipated that the equipment will be approved to Class 1 standard.

The whole instrument panel is covered by moulded plastic panels, behind which are concealed bulbs for back-lighting the instruments. Many Smiths car-type instruments are used, including fuel gauges, oil pressure and temperature gauges and an ammeter, specially developed with interior lighting. A P.6 compass is floor-mounted on the port side of the cabin, and there is an optional stand-by compass in the centre of the upper panel.

On either side of the central control box are mounted fuel gauges electrical switches, engine priming, carburetter and cabin-heat controls, and such optional equipment as a second altimeter and vacuum gauge. A point about the fuel gauges is that, as the auxiliary tanks are directly coupled to the main wing tanks, only two instruments are required. The stall-warning light and horn unit is located in the top panel.

A Beagle feature is a starting console housed in a central spine in the roof. From front to rear are the generator-field switch, master switch, toggle-type ignition switches (it is not practical to incorporate a key switch in the roof) and the starter button. All these services are enclosed in a hinged, moulded transparent plastic cover. Aft, to special order, can be fitted a radio loudspeaker. A roof light is standard. The console is hinged at the rear, and swings down for maintenance.

Electrics Ample power for all radio and navigation aids should be available from the standard 35A generator, which supplies current to a 12V, 25A-hr battery mounted in a glass-fibre box on the forward face of the firewall. The whole electrical system is governed by an electrical relay; there are no heavy-duty cables aft of the firewall. All fuse boxes are in the engine bay on the forward face of the firewall, and all normal services are switch-controlled.

Fuel system Total fuel capacity is 52 Imp gal, of which 16 gal are contained in each main tank and ten in each optional auxiliary tank. Fuel selection is by a two-way cock mounted on the floor under the pilot's legs. There is a priming pump on the panel, and smoking is permitted.

Cabin heating The basic Airedale includes a warm-air heating system. An intake in the nose cowl feeds air through a flexible duct to a heater muff around the silencer. Air is fed to a regulator on the firewall and distributed into the cabin through perforated tubes. There is no special provision for demisting, this function at present being served by ventilators in each wing root, which are pulled out and rotated to admit fresh air. An outside air temperature thermometer is an optional extra. All metal panels in the cabin are treated with a soundproofing compound, and interior trim is lined with glass-fibre. Trimming, has been carried out to motor-car standards by the Pressed Steel Company (parent of the Beagle group), in plastics fabric and includes special vacuum-moulded trim panels. There is a soft crash-pad around the instrument panel, and the interior is fully carpeted. The whole aircraft is painted with a butyrate polychromatic finish in several standard colour schemes.

BEAGLE-AUSTER A109 AIREDALE

One Lycoming O-360 A1A of 180 h.p., driving a McCauley 74in-diameter variable-pitch metal propeller.

Dimensions: Span, 36ft 4in; length 26ft 4in; height 10ft; wing area, 190 sq ft; wheel track, 72in; wheelbase, 70in. Wing incidence, root 3°45', tip 2°30'; dihedral, 2°; tailplane incidence, 1°. Engine offset, 3° starboard.

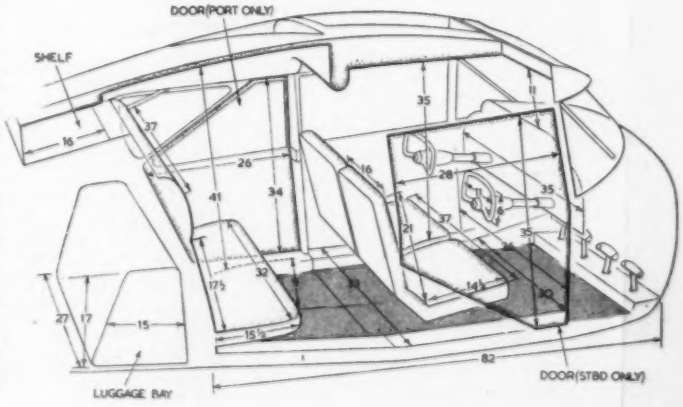
Control-surface movements: Rudder ± 20°; elevator, 30° up, 20° down; trim tab, ± 20°; flap, 0°, 15° and 40°; aileron, ±4.75in at trailing edge.

Weights: Maximum, 2,750lb; empty, 1,630lb; disposable load, 1,120lb; max fuel (52gal), 375lb (32gal, 231lb); pilot, passengers and baggage, 730lb.

Performance (with four occupants and about 50gal fuel): Max TAS, 148 m.p.h.; normal cruise, 5,000ft, 75% power, 141 m.p.h.; economy weak-mixture cruise, 7,500ft, 65 per cent power, 135 m.p.h. true; corresponding fuel consumption, 6.5gal/hr; stalling speed, flaps up, 60 m.p.h., flaps down, 52 m.p.h.; initial rate of climb, 750ft/min; time to 7,500ft, 15min; service ceiling, 14,900ft; take-off distance to unstick from runway, still air, 325yd; take-off distance from runway to 50ft, still air, 595yd; landing distance from 50ft on to runway, 425yd; on to grass 445yd; range with normal payload, 650 miles; max range with 570lb payload, economy cruise at 137 m.p.h. TAS, 1,050 miles.

Equipment supplied to special order: Sun-blinds; auxiliary fuel tanks; dual controls; Z-harness; cabin floodlighting by lights in wing roots; cigar lighter; stand-by bowl compass; second (QNH) altimeter; artificial horizon; direction indicator (vertical display); vertical speed indicator; vacuum pump and gauge; o.a.t. bulb; stop watch; radio to customer's requirements.

This dimensioned drawing of the Airedale cabin makes possible a comparison with any motor car—which is quite fair, for it is a Beagle-Auster claim that the aircraft has a "car-type interior". Dimensions, which are in inches, were measured by our artist



Straight and Level

The bravest man was Captain Brown,
Who played his ukulele as the ship went down.

I WATCHED *Panorama* on BBC Television the other night, and was intrigued by a feature on the future of the shipping industry—with particular reference to the North Atlantic route. One of my pet subjects.

Traffic figures were presented to show the beating that the shipping lines are taking from the airlines: sea traffic, 70 per cent of the total ten years ago, is now only 30 per cent, and is sinking rapidly. Air traffic overtook sea traffic in 1958, and is now double.

The spokesman for the ships was Mr C. M. Squarey, general manager of Ocean Travel Development, well known for his ukulele-playing whenever the future of shipping is discussed. Never, never, never—not even as the last Atlantic liner is tugged to the breaker's yard—will Mr Squarey concede that shipping is sinking, or even that it is on the rocks.

He dismisses proposals for very cheap sea fares as "uneconomic," thereby helpfully contributing to the development of North Atlantic air traffic. He evades the question (and no wonder) of whether it is right for the Government to spend £18m of public money on a new Cunard *Queen*, a national investment in a project that Mr Jo Grimond has described as the "status symbol of the thirties".

Mr Squarey is on a burning deck, but he is true to the traditional discipline of his industry. He knows his ship is being abandoned and that it is sinking; but he means to go down with it, standing stiffly at the salute on the bridge. Rather like Alec Guinness as the sea captain in *Kind Hearts and Coronets*, he awaits submersion with unflinching loyalty and devotion, until all that will remain is his cap, floating bravely away over the waves.

Shipping may make a comeback; but if it does it will be in spite of Mr Squarey's blind heroism.

Perhaps there was a picture hanging on this wall of the Luton Flying Club bar. I can't remember very well. Anyway, there is no doubt which picture should replace it when repairs are completed—a framed enlargement of this one. And for the Miles Messenger's log book the following entry: "April 19, 1961—Ran out of control during propeller swinging, went for a spin round the airfield and finished up in the bar. Nobody hurt"

● Tucked away at the bottom of page eight of a special April 1 supplement of the French aviation journal *Les Ailes* was a brief news item headed "LA GRANDE-BRETAGNE RENONCE AU D.H. 121." The report stated that the British Government has decided that de Havilland will renounce the D.H.121, to avoid prejudicing developments of the Caravelle—a decision made in "l'esprit de coopération traditionnel entre l'industrie aéronautique britannique et l'industrie française." Moreover, it was said, BEA have ordered 30 Caravelle 10s from Sud Aviation.

Flight did a little note about this and we despatched a deadpan telegram to Sud Aviation: "Please comment urgently on Les Ailes report of BEA order for Caravelles."

We have now heard from our colleagues on *Les Ailes*. They want us to know that our telegram to Sud Aviation, which was passed to them, is "jusqu'à ce jour, la meilleure réaction que nous avons observée à notre page fantaisiste et traditionnelle du 1er avril. Seul un anglais pouvait apprécier cet humour aussi justement."

I don't quite know how to say this, but it appears that le rire est sur nous. Anyway, only Frenchmen can lick their wounds with jokes as good as this one. And the only way in which we, the British, can now save face is for BEA to issue a confirmation of the *Les Ailes* news item.

● A recent report in the *Daily Telegraph* referred to the Ministry of Aviation's flying training unit at Stansted, and also to the separate special 707 and Comet conversion training courses that Ministry check pilots are now undergoing. A Ministry spokesman, it was reported, said he "could not divulge the cost of the unit, nor the cost of the conversion courses."

I should think not, indeed. How could a newspaper be so impertinent as even to think of asking such a question? Next thing we know the Press will be saying that the public has a right to know how public money is spent! I mean, *really*.

The Ministry's information office has evidently taken note of that famous exchange during the Peninsular War between the Duke of Wellington and a foreign diplomat. The diplomat, seeking military information, asked the Duke a question. In reply Wellington asked:—

"Can you keep a secret?"

"Oh yes," said the foreign diplomat, agog with anticipation.

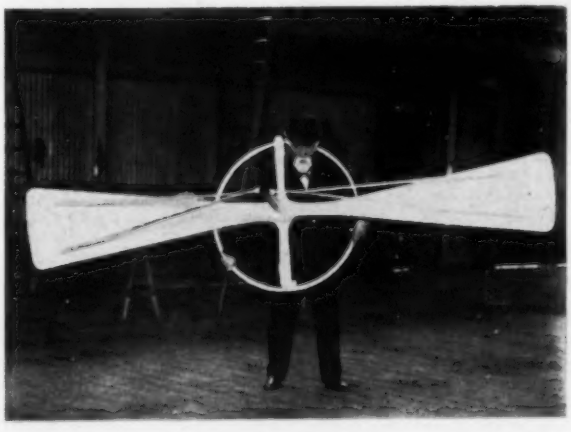
"So can I," thundered Wellington, and showed him the door.

We Are Slipping

● Report in the *Daily Express*, April 24, 1961:—

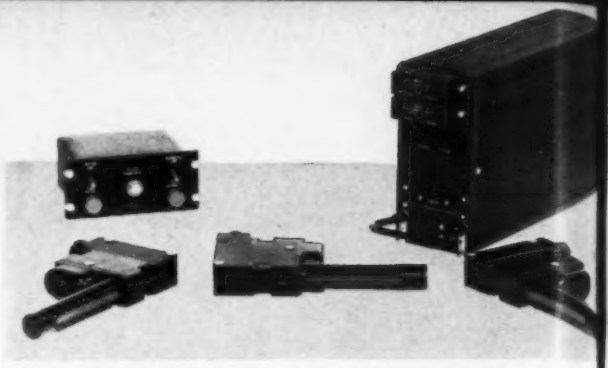
Britain is not expected to get a Mach 2 prototype airliner into the air until next year at the earliest. . .

ROGER BACON



Stand clear, laddie—right out of my way, there's a good fellow. I, Sir Hiram Maxim, haven't tried this out yet and I wouldn't like you to think that I have got the whole thing round my neck

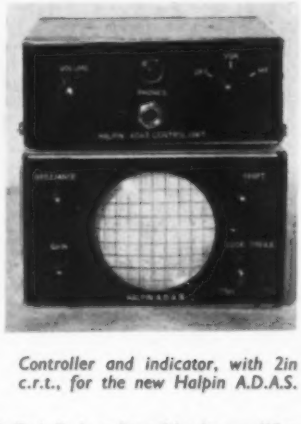
FLIGHT SYSTEM SURVEY



First picture of a production Smiths Para-Visual Director system, showing three indicators, controller and ATR amplifier taking computed signals from the flight director. This unit was installed in a KLM DC-8. Others are being evaluated by Boeing and BOAC in 707s and SAS in a DC-8

Halpin A.D.A.S.—Further Details

FULL provisional patent rights have been granted to Halpins of Hampshire Ltd for the Aircraft Directional Accuracy System, first described in these columns last week; and some further details have now been released by the company. A.D.A.S. is intended to provide private pilots with a fool-proof and accurate method of finding their way to any selected beacon and to tell them precisely when they pass over the beacon. A 2in cathode-ray tube indicator accepts outputs from special miniature receivers for both MF and VHF frequencies, thus serving both non-directional beacons and VOR.



Controller and indicator, with 2in c.r.t., for the new Halpin A.D.A.S.

Among unique features in A.D.A.S. is a logarithmic amplifier which prevents saturation of the receiver as the beacon is approached. A memory device tells the pilot when he was last pointing directly towards the beacon and the instantaneous position can therefore follow the previous position with great accuracy. Any movement off course is quickly shown and there is distinct indication of whether the aircraft is flying to or away from the beacon. A flashing indicator lamp to indicate overflying of the beacon will later be added. Accurate approaches have been made from Hythe NDB to Eastleigh in poor visibility. Selected VOR radials can also be flown.

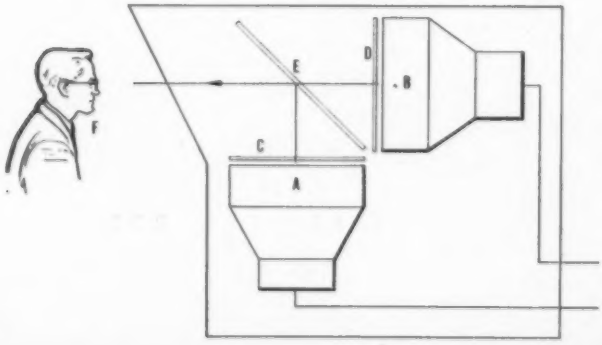
Halpin intend to produce the equipment at their Southampton radar establishment when MoA type approval has been granted. Initially, MF systems capable of handling VOR will be made, but a special VOR receiver phase comparator will be produced at a later date. A ferrite variable tuning aerial is used. Selling price should be under £200 and exports are being considered.

3-D Presentation of Radar

A METHOD of providing a 3-D display from the US Navy Frescan or US Army Frescanar 3-D electronic scanning radars has been developed as a private venture by Hughes Aircraft. Missile cruisers and destroyers and the Army Missile Master system already employ the radars, but operators at present watch separate plan-position and height displays. Now, Hughes offer the Stereotron display based on two c.r.t.s. mounted at 90° to each other with a half-silvered mirror at 45° to both tubes, as shown in the diagram at the foot of this page. Polarized filters cause the information displayed on each tube to be seen with different eyes; and the returns are then painted on each tube face in such a way that the viewer sees the two traces of the same target with an amount of visual parallax which is proportional to target height.

The Tonotron tubes used in Stereotron incorporate long persistence tracer so that each target leaves a trail. They can be viewed by several people in normal room-intensity lighting and Stereoscan can be added without modifying the basic Frescan. Off-the-shelf components were used and, it is claimed, the display can be interpreted more accurately than existing ones.

Hughes 3-D presentation for their Frescan 3-D radar. A and B, Hughes Tonotron c.r.t.s; C and D, polarizing light filters; E, half-silvered mirror; F, observer wearing polarized glasses



Testing VOR/ILS on the Spot

A PORTABLE, self-contained test set with which one man sitting in the cockpit can test the VOR, ILS, glide-slope and marker beacon receivers in an aircraft has been produced by Communications (Air) Ltd, a company which joined the A.C. Cossor Group last September. Called Field Test Set Type FT.13B, the equipment can be placed a short distance ahead of the aircraft and will perform a programme of up to 71 tests by radiating from telescopic aerials six simulated VOR bearing signals on each of 20 channels in the VOR band; differential modulation between 90 and 150c/s on each of 20 channels in the ILS localizer band; differential modulation between 90 and 150c/s on 20 glide-path channels; and 75Mc/s signals modulated at 400, 1,300 or 3,000c/s with high and low carrier levels.

All carrier signals are crystal controlled. Closed-circuit testing can also be applied; and brilliant lights in the equipment, visible from the cockpit in direct sunlight, indicate which test is being carried out. The 71 tests can be automatically completed in 10 min or an additional cable will allow direct control from the cockpit. Various modulation levels and RF channels can also be manually selected. The FT.13B weighs 39lb and costs £574 10s without crystals.

The FT.13B ILS, VOR and marker beacon signal simulator for programmed testing of airborne equipment, by Communications (Air) Ltd of Bagshot

Miniature ADF Sales

MARCONI have sold no fewer than 154 of their AD.722 miniature radio compasses this year. All but four of these were for export and important repeat orders came from Italy, Spain and Malaya. AD.722s are now to be installed in Heralds, Friendships and Avro 748s as well as in executive aircraft. They are already widely used by the RAF.

SCAT—at the Right Speed

CONSIDERABLE airline and military interest has been shown in the Safe Flight Instrument Corp SCAT system for achieving correct rotation and climb-out and correct approach speeds. Basically, it consists of a vane set in the leading edge of the wing, a flap-position transducer and an electronic unit containing a horizontal acceleration transducer. A signal proportional to the ratio of C_L to C_{Lmax} is added to the horizontal acceleration signal in such a way that the needle indicator will show "fast" if decreasing lift ratio and forward acceleration are sensed; and "slow" if increasing lift ratio and deceleration are present. It is possible to use SCAT as an elevator demand signal between V_R and V2 speeds and as a power director during the approach.

Correspondence

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. Names and addresses of writers, not for publication in detail, must in all cases accompany letters.

How Dense is Dense?

THE table on page 455 of your April 6 issue attracted my attention. It seems to me to point up once again the fallacy of the oppressive restrictions placed on any civil aviation other than the airlines by the Ministry of Aviation. Rules that bar others from airports, and from various parts of the airspace, must be presumed to be intended to keep aircraft from colliding. If this premise is correct, then the primary factor to be considered is traffic density—how many aircraft of all types are trying to use the same piece of airspace at the same time.

Your table has served as the basis for a table of my own composition, which follows. It should be obvious that the hazard implied by the various MoA restrictions doesn't even begin to exist in the U.K. Either that is true, or the American philosophy is such that the public is being subjected to an almost continuous rain of aircraft wreckage and bodies.

Airport	Total movements	Comparable US airport	Total movements*	US rank†
Heathrow	146,506	Sacramento, Calif	147,309	55
Southend	69,991	Flint, Mich	70,086	165
Gatwick	35,848	Brownsville, Tex	37,644	216
Manchester	34,029	Hilo, Hawaii	34,548	217
Ferryfield	33,716	Hilo, Hawaii	34,548	217
Blackpool	32,460	Muskegon, Mich	32,534	218
Birmingham	31,190	Muskegon, Mich	32,534	218
Luton	29,232	Pendleton, Ore	29,335	219
Prestwick	24,671	Wheeling, W Va	24,822	222
Stansted	24,049	Wheeling, W Va	24,822	222

* For calendar year 1960 † Among 229 control towers operated by FAA

Washington, DC — MAX KARANT, Vice-President, AOPA

RAF and Advisory Direct Routes

FLYING regular schedules on ADR160 and having experienced numerous near-misses and recently one very near-miss I should like to draw readers' attention to an interview I had with the RAF. This concerned a near-miss which would have been fatal if visibility had not been two to three miles as both aircraft were "head on" at the same height. I learned at the interview that the RAF pilot i/c of the aircraft concerned with mine knew about ADRs but as the RAF neither print them on their maps nor officially recognize them he was content to fly down the ADR, at a height, I may add, that was not quandrantal, in IMC.

That this state of control, or lack of it, should continue to exist is unpardonable and either the RAF should recognize an ADR or the MoA make them Airways before a fatal accident occurs. I understand the MoA are considering an Airway to run to the West of ADR160 but no doubt they will not act until a fatal accident occurs. Like your recent Editorial I agree that a genuine near-miss incident should be classed as an accident and the appropriate action taken immediately.

Jersey, CI — AIRLINE CAPTAIN

The Space Race

ALTHOUGH in light of the recent outstanding Soviet space achievement this may not be the most propitious moment to offer additions to the remarks made in my article "The Space Race" (*Flight*, March 16), I feel that Mr Smith's comments (Correspondence, March 30) justify some brief rejoinder.

Mr Smith's views and my own do not differ greatly in the main, but only in detail. I do not, however, agree with the proposition that instrumentation and telemetry cannot be fully exploited until a booster "bridge" has been crossed. The scientific purpose in space is to acquire a given amount of data, the more the better. From an abstract scientific viewpoint, therefore, the size of the booster used in any experiment is really inconsequential, provided that the desired information is obtained. And if, as I contend, the US possesses instrumentation and telemetry equipment of a much lower unit weight than does the Soviet Union, it is perfectly possible for America to acquire more data per flight than can the Russians, irrespective of the size of the boosters involved.

For example, the unit size of batteries ordinarily used in aircraft is appreciably larger than that of the batteries which the US now employs in her satellites. Yet the smaller "space" batteries have performance identical to the larger, less efficient aircraft counterparts. If the Russians were behind in the electronics field and had to utilize aircraft batteries, they would accordingly lose a percentage of the payload which might otherwise contain scientific instrumentation. A point to remember is that the Soviet ICBM, designed for exactly the same mission as the Atlas/Titan missiles, is nearly twice as heavy as the American equivalents. Why, except for the fact that Russian equipments are heavier?

A second point which can be debated further is Mr Smith's conclusion that Russia has a lead in the scientific aspect of space. In this connection, the possibility was raised that the Soviets might actually have accumulated a wealth of data, but have not released any of it lest America close the gap. As is freely admitted by nearly everyone, the difference between the two countries is in booster *size*, nothing else. Nothing that the Soviets might release in the way of satellite data will change the rate of development of America's big boosters.

A much more likely reason for their secrecy, as has been contended on several occasions, is that Russia hopes, by being secretive, to let the public's imagination roam to the point where all kinds of false rewards are credited to them. For example, many people in America have the erroneous impression that the Russians, because of their Venus probe, have obtained worthwhile data about the mysterious planet. Few average persons are aware that contact with the probe was lost not many days after it was launched from a "parking" orbit. In an absolute scientific sense, the probe may have been an almost complete failure—at least, it probably did not gather much data about Venus. The booster and guidance system worked, of course, but the Soviets have already proven on many occasions that they possess these facilities. Just because the booster worked again is no reason for *scientific* rejoicing; nor should the world necessarily believe that the desired data was obtained but is being concealed from America's view.

Apart from Mr Smith's comments, it will be interesting to see whether or not a premise of mine (and, of course, of many others) —that the Soviets are exploiting space for propaganda, rather than for scientific purposes—holds true in the case of their manned spaceflight. Maj Gagarin's name will be, and certainly it deservedly should be, inscribed in history alongside those of the world's great explorers. Nothing that America or anyone else will ever subsequently do in the way of orbiting spaceflight can diminish the major's or Russia's triumph in any way. But I am slightly disappointed that the pilot's report is lean on technical details and heavy on the aspect that it demonstrates the superiority of one society over another. I may be very unaverage, but I much prefer the "I was scared as hell" type of post-flight report as given by the X-15 pilot during his most recent speed/altitude record run.

New York — DON ADAMS

Parnall Panther Remembered

THE letter from Mr J. M. Bruce on the Parnall Panther in your issue of April 20 stirs my memory. In the summer of 1918, I was one of the very few RFC pilots stationed at the Isle of Grain, then under the command of Gp Capt Harry Busteed; I had been posted there because it was hoped that my very considerable flying experience on rotary-engined aeroplanes would assist the authorities in developing "land" aeroplanes in such a manner as would enable them to alight on the sea without the usual consequences of much damage to the aircraft, not to mention the injuries usually inflicted on the pilot because of the very rapid nosing-over.

The nature of the research was (1) the placing of a hydrovane in front of the undercarriage (and it was really quite remarkable how such a surface with a very narrow chord inhibited any propensity to nosing-over); (2) the premeditated dropping of the landing wheels; and (3) as the requirement was, generally speaking, for shipborne aircraft, the fitting of skids in place of wheels. To enable experimental flying to take place on dry land a wooden deck structure was erected on Grain aerodrome.

Now to the Parnall Panther, and my memory on some aspects is a little hazy and on others very clear. The number of people, including Harold Bolas, attending this test flight makes me think that the aircraft involved was a prototype of a particular version of the Panther. It was certainly fitted with a hydrovane and landing wheels that could be dropped at the will of the pilot. I think it had an arrester hook or a tail-skid designed for the dual purpose. I was instructed to test the handling qualities, and it was urged upon me not to press or pull knob "A" or whatever it was that jettisoned the wheels. I found the Panther delightful to handle and I was enjoying myself when I realized that something untoward had happened by an airman on the landing deck holding two wheels up aloft, and it then dawned upon me that they were my wheels, whereupon I gingerly landed the aircraft on the wooden deck as slowly and gently as possible, and I was very relieved when it equally gently came to a halt with only very very minor damage to the undercarriage structure and one wing tip.

As I rather expected, all the brass hats, etc, were kind enough to ask me why I couldn't leave knob "A" alone, to which I replied with some heat that I hadn't touched the wretched thing, and luckily an examination quite conclusively proved my point. But it was fun while it lasted.

If anyone can jog my memory as to details, etc, of the Panther I would be delighted.

Heston, Middx — G. A. LINGHAM

CORRESPONDENCE . . .

Australia's First Airliner

IN your issue of March 16, Mr Lincoln A. Ward of Inverell, NSW, draws attention to the fact that the Drover is not Australia's first and only airliner. He is perfectly correct in saying that the first Australian-designed and -built airliner was the Lascoter. However, he is wide of the mark in saying that this makes the Drover Australia's second airliner and the only Australian-built multi-engined airliner.

In actual fact, the Drover is Australia's fifth of local design and construction and the fourth multi-engined one. Shortly after the appearance of the Lascoter in 1930, W. S. Shackleton was responsible for the first multi-engined Australian airliner, the Lasconder, a tri-motor. In 1934 the Codock high-wing monoplane with twin Napier Javelin engines was designed by L. J. (now Sir Lawrence) Wackett, drawn by T. W. Air—lately in charge of Blue Streak activities for de Havilland—and built by Cockatoo Docks in Sydney.

In 1936 the Tugan Aircraft Co at Mascot put into production the L.J.W.7 Gannet, again designed by L. J. Wackett and fitted with twin Gipsy 6 engines. Both these types were using the familiar Fokker plywood-covered box-spar wooden wing and a welded-steel type fabric-covered fuselage. About a dozen Gannets were built and this type was, in fact, operated for some years by Butler Air Transport on routes which included Sydney-Broken Hill.

Several other Australian airliner designs have been promoted; but to the best of my belief these five, including the Drover, were the only ones which actually went into service.

Melbourne C1, Australia JOHN L. WATKINS
Director of Engineering, Trans-Australia Airlines

"Shores of Tripoli"

USAFE is the main source of my aircraft interest, mainly inspired by the proximity of RAF station Wethersfield. So it was with interest that I read the article about the USAFE Weapons Center at Wheelus AFB, published in *Flight* for April 20.

However, I must disagree with the caption to the second picture on page 534. This referred to a "C-130 of the 322nd Air Division," behind which stood a C-124 of MATS. It would appear to be that the aircraft in the foreground was, in fact, a C-133A, also of MATS, actually hailing from a Logistics Wing based at Dover AFB. Surely no C-130A ever had such a square-cut fin, and a "thimble" radome? It is general practice, also, with the C-130, to have the last three digits of the serial in approximately 4ft high figures on the nose, behind the cockpit, and not the last four digits enclosed in a rectangle, under the cockpit, as depicted.

Halstead, Essex K. RAYNER

[It was a C-133A.—Ed.]

FORTHCOMING EVENTS

May	4	RAeS: Annual General Meeting.
May	5	RAeS Man-powered Aircraft Group: a.g.m.
May	5	RAeS Rotorcraft Section: "The Helicopter—the first of the VTOL Aircraft," by Raoul Hafner.
May	8	RAeS Historical Group: Discussion Evening.
May	9	RAeS: "Structural Weight Estimations for Novel Configurations," by M. E. Burt.
May	10	RAeS Graduates' and Students' Section: "Aeroflot," by G. A. Yarotski.
May	12	Institute of Navigation: "Airborne Weather Radar," by Capt R. C. Alabaster and P. L. Stride.
May	13-22	British Gliding Association: National Championships, Lasham.
May	16-18	Institute of Navigation (in conjunction with French and German Institutes): Convention on "The Avoidance of Collision at Sea and in the Air by Land- or Shore-based Aids," Dusseldorf.
May	18	RAeS Astronautics and Guided Flight Section: "The Agena Satellite and Discoverer Programme," by R. Smelt.
May	22	RAFA Display, Hucknall, Notts.
May	22-24	Institute of the Aeronautical Sciences: National Telemetering Conference, Chicago.
June	2	RAeS Rotorcraft Section: "Development of Stabilizing Equipment for Helicopters," by P. D. MacMahon.
June	15	RN Air Station Lee-on-Solent At Home.
June	17	RN Air Station Yeovilton At Home.
June	17	Tenth Tactical Reconnaissance Wing, USAF, Open Day, RAF Alconbury.
June	17	RAeS Rotorcraft Section: Helicopter Rally and Garden Party, Dunsborough Park, Ripley, Surrey.

THE INDUSTRY

Folland Future

"WE of Follands have had a few knocks in the past two or three years, but we hope by each that we have learnt something. Our present position is stronger than it has ever been before." Thus Mr D. G. Brade, director and general manager of Folland Aircraft Ltd, at the company's recent distribution of apprentice prizes at Hamble. He went on to say: "We have an intensive programme of work on contracts for both military and civil aircraft. . . . We feel certain that our present orders for the Gnat Trainer and the Avro 748 wings are by no means the last. In fact we are confident of considerable additions to both contracts."

Both Mr Brade and the education officer, Mr F. C. Kirkpatrick, were anxious to dispel doubts about the future. The latter said that without Folland support the National Certificate courses in aeronautical engineering at Southampton University and Technical College might well have come to a halt. Fortunately, he said, the recent recession in the aircraft industry in the Southampton area had now passed. "We are now looking forward to an expansion programme unique in some respects . . . to which I cannot refer at the present time."

Air Marshal Sir Richard Atcherley, sales director, and Michael Curran, outstanding apprentice of the year, replied to Mr Brade's speech.

Silicones in Hydraulics

AT £1,000 for a 40gal drum it is now possible to obtain a hydraulic fluid with an operating temperature range between at least −52°C and +250°C. A chlorophenyl silicone known as DP 47, the fluid is manufactured in Great Britain by the Nobel Division of Imperial Chemical Industries under the trade name Silcodyne H. Another fluid, Silcodyne M, consists of Silcodyne H with an oxidation inhibitor providing additional load-carrying capacity. DP 47—the result of several years' work by ICI and by the Silicone Products Department of GEC of America—has already been specified for one new British aircraft, although this is not the supersonic Bristol 188. It has been used in the US in GE hydraulic constant-speed drives, but no complete hydraulic system has yet been flown.

A "low-flam" fluid, Silcodyne H undergoes variation of viscosity with temperature from 2,848 centistokes at −54°C to 65cS at 38°C and 2cS at 370°C. The fluid does not decompose below 316°C and the rate of breakdown is then linear with temperature, the breakdown products being volatile. This temperature is much higher than with most other hydraulic fluids, although bulk modulus is low at lower temperatures. As a result, systems designed for Silcodyne H will be heavier, but the low rate of viscosity change and lower line-losses should improve system-characteristics. The fluid is stated to be almost completely non-toxic.

Careful system-design is required. As carbon dioxide dissolves in the fluid and destroys its lubricity, it is recommended that nitrogen be used for pressurization, although in the US air has been used successfully when separated from the fluid by a membrane. Foaming is a problem, and provision for de-aeration in the tank is necessary. Special seals will be required, since elastomers are not satisfactory over the wide working temperature range for which the fluid is designed. Viton A seals must be used above 90°C, but fall short at low temperatures; ICI recommend the use of metal seals (possibly including metallic O-rings) and chamfered piston rings. Care must also be taken over piping, since normal screw-type couplings will leak at high temperatures. DP 47 is not compatible with copper (or for that matter with steels which cannot be carburized or nitrided) and the use of welded stainless-steel pipe is recommended. Failing this, pipes should be machine-flared. Special thought must be given to corrosion protection, since it may never be possible to make DP 47 corrosion-inhibited.

IN BRIEF

Mr T. Morrison, who joined the Solartron organization in 1954 as a technical sales engineer, has been appointed group field sales manager, Solartron Electronic Group Ltd.

RCA Gt Britain Ltd announce that their type AVQ-9A radar altimeter has received MoA approval. It had previously received American FAA certification.

Rumbold & Co Ltd, seating specialists, recently delivered 61 seats—doubles (37lb) and triples (52lb)—to an important airline 27 days from the date when the order was received. They received a letter of appreciation from their clients for "an outstanding achievement."

Mr D. J. Flunder, general purchasing manager of the Dunlop Group for the past two years, is to become general manager of the chemical products division in Birmingham. He succeeds Mr N. G. Bassett Smith, who is to become general manager of the Dunlop Footwear Co.

Gp Capt W. G. G. Duncan Smith, DSO, DFC, has been appointed aviation sales manager of the Triplex Safety Glass Co Ltd. He retired from the RAF last December after 22 years' service, which during World War II included Fighter Command, Malta and Desert Air Force operations. One of his post-war appointments was that of personal staff officer to Air Marshal Sir Basil Embry as AOC-in-C Fighter Command; and he commanded the Scottish Wing of the RAuxAF.

The *News of the World* Organization Ltd have agreed to purchase the whole of the issued share capital of Vactric (Control Equipment) Ltd and Vactric (Precision Tools) Ltd from the receiver of Vactric Ltd, which is in liquidation. New boards are being formed with Sir William Carr as chairman, the present managing director, Mr T. W. Roberts, continuing in that capacity. Management of the two companies remains the same.

PROCAER F.15 PICCHIO in the Air

BY MARK LAMBERT

No 146 of the series

"Flight" photograph

THE Italians have given us masterpieces of art and engineering without number—perfect blends of line and shape, technical ingenuity and skilled craftsmanship. In the aircraft field an excellent example is the work of Stelio Frati, who since World War Two has designed more than a dozen sleek and graceful aircraft, including the splendid Falco aerobatic two-seater and its four-seat derivative, the Nibbio. Batches of these aircraft were made by Aviamilano at Milan; and Frati then joined Procaer and designed the Picchio, which I think is his best yet.

In 1957 I referred to the Falco as "a real pilot's machine, a small fighter and a two-seater fit for kings to show their ladies." In *Flight* for October 16, 1959, I reported on my second flight in a Falco, this time in the first British-registered aircraft, and tried to dispel what I felt was a growing nervousness about this allegedly hot and slippery aeroplane. I found that it stalled decisively, but at only 62 m.p.h., and that it was surprisingly tractable and manœuvrable at speeds only 10 m.p.h. above the stall. It could be landed in a perfectly normal way from a power-off approach at 80 m.p.h.

The point is that the average British private pilot will never have encountered anything so crisp and light as these Italian aircraft. I heard someone say after first flying the Falco that one had to approach at 100 m.p.h. and really needed a good runway. This is just not true, and a few minutes of experiment in the air reveal a surprising docility near the stall and remarkable control effectiveness at the very lowest speeds. Aviamilano took great trouble to make the Falco as docile as possible without affecting its 186 m.p.h. cruising speed on only 140 h.p.

The same applies to the Picchio. A service-trained pilot would be delighted by it: the PPL type would feel just the same after a few hours at the controls. But enough of these preliminaries. Here is my report on what I consider to be Europe's most exciting touring aeroplane. The British agents are Maxfield Aviation Co Ltd, 66 Pembroke Road, London W8.

The Picchio is powered by a Lycoming O-360-A1A engine and constant-speed propeller giving 180 h.p. for take-off. The wooden airframe is glued with synthetic, water-repellent glues and all wood surfaces coated with synthetic varnishes giving, the makers claim, the same durability as a metal structure. All external surfaces are formed by prefabricated ply sheets to which thin plates of Peralluman 45 corrosion-resistant aluminium alloy are glued.

The first five Picchios had a 160 h.p. engine and three seats. They were followed by ten F.15A Picchios with the 180 h.p. engine, four seats and various improvements. It was the seventh of these aircraft that I flew. Now Procaer have completed the first two of a batch of 25 F.15Bs which have all the fuel in two wing-tanks (making smoking in the cabin permissible), all-metal moving surfaces, and other detail improvements; and Procaer are working on the necessary features, such as jettisonable windows, to allow certification for aerobatics. Stressing is adequate for aerobatics with two occupants.

External finish, with a coat of clear protective varnish over the virtually unbroken metal surface, is superb; and the small, laminar-flow wing, with its 144 sq ft area and 9 per cent t/c ratio at the tip, must be working very effectively. Controls are conventional, with fixed tailplane and normal elevator trim-tab, the control column in the cockpit being curved deeply forward and back to clear the knees. The hand-grip is an oval loop which is comfortable to hold. Slotted flaps are manually extended by a lever between the seats to about 20° and 40° for take-off and landing and proved very effective in reducing stalling speed and increasing drag. The main undercarriage with levered suspension and nosewheel with long-stroke oleo are extended together by a single electric motor, there being mechanical indicators on wings and nose as well as lamps in the cockpit. Some 32 turns on a folding handle will operate the undercarriage mechanically in case of motor failure. The nosewheel is directly connected to the rudder pedals for steering on the ground, the tightest turning circle being rather wider than for equivalent American or French aircraft. Both hydraulic mainwheel brakes are operated together from a long horizontal lever which emerges from beneath the panel on the left—an unusual but very comfortable control.

Access to the cabin is by walkway over the starboard wing-root and through an upward-opening door with catches and locks which are stout and easy to operate. The front seats are fixed, but their back-rests fold down to allow very comfortable access to the rear bench seat, where there is plenty of leg- and head-room. Immediately behind is the baggage shelf with accommodation for 40kg. The front seats are not so easy to get into, but not so much more difficult than those of a Comanche.

Instrument-panel space is adequate for a blind-flying panel on the left, together with stall-warning lamp and hooter and parking-brake lever, and, to the right, the engine dials, fuel contents and pressure gauges, ammeter and magneto switch. Just beneath the centre of the panel are the vernier throttle and pitch plungers, mixture, carburetter heat and cabin heat controls. A small winding handle and indicator in the roof serve elevator trim. The centre of the panel is for electrics, with a block containing all circuit-breakers and switches and the undercarriage switch and starter button with their little guard plates. There is room above for two Narco Mk 5 radios or equivalent.

Upholstery and furnishing are comfortable and neat; and the combination of "solid" roof and high side-windows, together with a high seating position, give excellent visibility. Both tips of the tailplane are visible and the small wing interferes very little with the view of the ground. A useful feature is that the roof is swept fairly far down in front, forming something like the peak of a cap for the pilot; folding visors are also fitted. Ventilation is by two very large adjustable intakes, one on either flank level with the pilot's calves. They are accurately adjusted by two vernier controls on the

PROCAER F.15 PICCHIO in the Air . . .

panel and, though somewhat noisy, are very effective. To say they are noisy is, of course, an indication of the remarkably low noise-level, and this is one of the many excellent features of the aircraft. Incidentally, the Picchio is a genuine four-seater and can carry its full 43 Imp gal fuel load, four 165lb occupants and 66lb of baggage for 1,000 miles at an economical cruising speed of 137 m.p.h. At 70 per cent power I found an i.a.s. of 170 m.p.h. at 3,000ft.

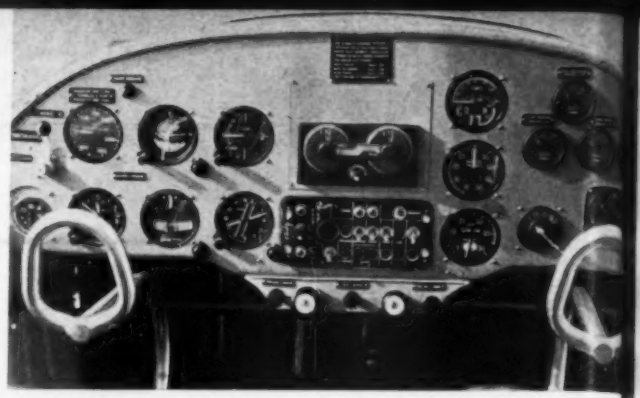
On the ground, the aircraft handles very nicely, with accurate throttle and brake control. Steering is rather heavy, but the effort is barely noticeable when one is making the normal gentle turns on grass or concrete. Directionally, the Picchio remains extremely stable when taxying, taking off or landing. Forward visibility is virtually uninterrupted: the nose sits so low that one feels the propeller must almost touch the ground.

Best take-off is with half flap and there is immediately enough elevator to relieve the load on the nosewheel. The aircraft flies off very smoothly and then gains speed fairly slowly, the undercarriage motor taking about 15sec to raise the wheels. Immediately apparent is extreme smoothness and sensitivity of control without that perched-on-a-pin quality the French so admirably call "nervous."

As I went on flying the Picchio, first with Procaer's French test pilot P. Bonneau from Leavesden, and then solo some days later from Redhill, I came to the conclusion that the feel could be described as a perfect scale model of the best one has ever known before. The aircraft would fly hands-off for long periods, but the control forces never seemed to exceed a few pounds and the Picchio seemed to melt like butter under my hands. The stick rate was even, yet all the correct trim changes with speed and power and altered configuration were there and easily noticeable. Ailerons remained very powerful throughout the speed range, either during a 70°/sec roll at 320km/hr (199 m.p.h.) or during the final approach at 150km/hr (93 m.p.h.) in a blustering, gusty 20kt wind. The Picchio did snake in rough air, but application of rudder caused only slight bank and the nose flicked straight again as soon as pressure was released. The trim winder could be precisely set and there was ample travel available.

The noise-level was so low that Bonneau and I could converse with only barely raised voices while cruising at 70 per cent power. I flew for some time in formation with *Flight's* Gemini while photographs were taken and found the Picchio easy to position for the camera. When the Gemini formated on me, I out-climbed it easily on less than cruising power and, after the photography was over, opened up and practically walked away from it. I then rolled twice in front of the Gemini, leaving (I was told later) long curling streamers of vented fuel behind me. It was sheer bliss.

With Bonneau during the first flight, and by myself afterwards, I spent some time looking at the low-speed end of things to see whether the Picchio was in fact "hot." It certainly took some time to slow down and, with everything in, the increasing angle of attack became noticeable at 160km/hr (99 m.p.h.). At 105km/hr the stall-warning horn sounded stridently and at 100km/hr (62 m.p.h.) we curled smartly over into a vertical spiral dive. But Bonneau then took over and juggled the Picchio into a flat descent with the stick hard back, holding the wings up with liberal aileron and rudder at a rate of descent of 2,000ft/min. The aircraft was then juddering hard, but it had given virtually no warning when I stalled it. I next lowered gear and full flaps (maximum speed for both is 180km/hr, 112 m.p.h.), noticing that the flap ratchet was inclined to slip. There was also a tendency to be surprised by the load when increasing from half to full flap and I let it all come up for a moment before applying it again. But the Picchio did not mind and there were no noticeable trim-changes as it happened. In fact, one really becomes aware of the trim-change only after everything has come down and the speed has settled. Then, less than full aft trim will hold 150km/hr with a forward c.g.



The Picchio instrument panel is not large, but it is neat. Note the central switch panel beneath the radio, with instruments on either side

The stall with everything down was very similar to the clean one, but it came at only 50 m.p.h. with a bleat from the warner and then the roll into a full spiral dive. But again Bonneau showed me that the Picchio could be juggled into that flat descent. I later tried this for myself and, though I did not quite succeed in sustaining the flatness, I was surprised to find remarkably crisp aileron control long after the aircraft had stalled; and recovery from the flat stall was immediate as soon as pressure was released. At 120km/hr (75 m.p.h.) I pulled the nose sharply up and the Picchio responded without breaking away. I also tried steep turns at about 180km/hr (112 m.p.h.) with the aircraft clean. As I progressively pulled more g, a distinct hard buffet appeared. Then the left wing twitched down, but recovered the instant I relaxed pressure. The warning was so clear that I imagine it would be extremely difficult to flick inadvertently out of a steep turn.

From a simulated approach with everything down, I applied full power with the controls free. The nose came up slowly and the speed remained virtually constant. At less than maximum weight we climbed at 500ft/min, but speed and rate of climb increased healthily when gear and flaps came in.

With Bonneau I tried some simple aerobatics. He advised about 320km/hr (199 m.p.h.) for a roll without negative g and, for a loop, almost 400km/hr (250 m.p.h. and well beyond the red line on the a.s.i.). We pulled a good deal of g going up in an effort to avoid stalling off the top. Almost like a loop in a jet aircraft, it took some time and height. The aerobatic performance is there, but I wonder whether it is really for casual amusement. One cannot, afford to stall upside-down; a good height margin seems advisable, certainly while learning the aeroplane. I rolled upwards quite happily at about 180 m.p.h. after a low pass over Redhill.

For the landing, Bonneau advised an approach at 135km/hr (84 m.p.h.) if lightly loaded and 160km/hr (99 m.p.h.) if fully loaded. The flaps provided powerful drag and plenty of power was needed to hold speed in the final stages, but the round-out was absolutely normal and the nosewheel could be held up long after the mainwheels touched, even on longish grass. The float was also sufficiently long to suggest that a speed over the hedge of about 135km/hr (84 m.p.h.) was perfectly adequate. I tried this once and found no difficulty, even though I was being roughly thrown about in gusts. Incidentally, Bonneau showed me that one can raise and lower flaps and fiddle with the throttle during the approach without touching the controls.

Altogether, I flew the Picchio for two hours from two airfields in different wind conditions, in formation and by myself, with Bonneau and solo. I am convinced that it is docile and tractable, although an inadvertent stall is to be avoided. It certainly gave me more sheer pleasure and satisfaction than anything I have flown since the Hunter Two-Seater. Apart from delightful handling, the Picchio also has exhilarating performance, excellent endurance, comfort and a quiet cabin. If I had about £9,000 I would buy one.

This view and the picture on page 601 clearly show the Picchio's grace and charm. Its performance and superb handling match its appearance

"Flight" photograph

PROCAER F.15 PICCHIO

(One Lycoming O-360 giving 180 h.p.)

Span, 32ft 8in; length, 24ft 8in; wing area, 144sq ft; empty weight, 1,530lb; useful load, 1,066lb; gross weight, 2,600lb; wing loading, 18lb/sq ft; power loading, 14.4lb/h.p.; fuel capacity, 43 Imp gal.

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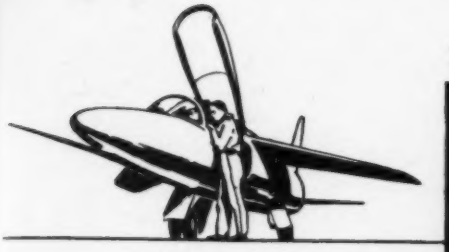

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". . . a task to which young men of quality may address themselves without the slightest fear of their abilities being wasted or their efforts being unrewarded" (CAS, Air Chief Marshal Sir Thomas Pike, at the Royal Academy dinner): at right, twenty-three-year-old Fg Off Peter Perry, first of a new generation of V-bomber captains, enters his Valiant at Honington. Once a co-pilot with 90 Sqn, to which he was posted from flying training, he is now back with the squadron after OCU

SERVICE AVIATION

Air Force, Naval and Army Flying News

Outdoing the Navy

A NEW record time for a London - Malta flight, 2hr 3min 8sec, has been claimed by the RAF. It beats by over nine minutes the official record time, 2hr 12min 27.2 sec, set up by a Scimitar of the Royal Navy in June 1958. The new time was achieved by two Hunters from Stradishall, which flew from Farnborough to Luqa in just under 2hr 4min at an average speed of 633.3 m.p.h. This distance is 1,305.33 miles, giving the new record time for the city-to-city distance (London - Valletta) of 1,298.14 miles. The pilots were Wg Cdr H. Bennett, who is OC Flying at Stradishall, and Flt Lt H. Davidson of No 1 Sqn. The existing record was set up by Lt Cdr D. F. Robbins.

Royal Flush VI

THIS year's Allied Air Forces Central Europe reconnaissance competition, Royal Flush VI, is being held from May 14 to 20. It will be at Beauvechain, the Belgian Air Force base near Brussels; and Danish, Norwegian and German Air Force units are taking part for the first time. The Danes and Norwegians are flying with RAF, Dutch and Belgian teams of 2nd ATAF and the Germans with the French and USAF representatives from 4th ATAF. There will be two types of mission, day sorties (short, medium and long range) and night sorties. The RAF are using Hunters for short-range competition, Canberra PR.7s for the long-range and night sorties. Republic RF-84Fs will be used for short range by the French Air Force, for medium range by the Dutch, French, Belgian, Danish, Norwegian and GAF teams. The USAF are using RF-101s for medium-range and RB-66s for long-range and night sorties in the contest.

Blue Diamonds

NICKNAMES are already being given to 92 Sqn, as they were to Treble-One: after their first-ever public display, at RAF Wildenrath recently, a German national newspaper described Fighter Command's new aerobatic team as *Blaue Diamanten*. The German spectators, a correspondent writes, were as impressed by the squadron's white overalls as they were by the royal-blue Hunters in the air. Experienced on-lookers agreed that the new team had made an effort to create their own brand of aerobatics, and had succeeded to a remarkable degree: two particular manœuvres, a line-abreast roll and a double "O" loop, were highlights of the performance.

60's Successive Success

"MOST proficient squadron of the Far East Air Force in the use of fighter and ground-attack weapons": thus can No 60 Sqn describe themselves again, having won the Scarf Trophy for the second time running. In doing so they beat No 28 Sqn (Venoms) and two RAAF squadrons, Nos 3 and 77 (Avon-Sabres), targets being set according to the aircraft and their performance and rate of fire. No 60, which has Meteor night fighters, is to start re-equipping with Javelins this summer. The Scarf Trophy is named after Sqn Ldr A. S. K. Scarf, who won a posthumous VC for his lone attack on Japanese invasion forces in a Blenheim of No 62 Sqn in December 1941.

Bomber Command Competition

A PAPER factory north-west of London, an island on a lake in the Manchester area and an isolated building south-west of Stirling in Scotland were targets in the recent annual Bomber Command bombing and navigation competition. After carrying out simulated attacks, crews had to fly a further thousand miles over the sea, using astro-navigation only. Premier award for bombing and navigation, the Laurence Minot Trophy, was won by No 90 Sqn (Valiants); the Armament Officers' Trophy, for bombing, by No 10 Sqn (Victors); and the Sir Philip Sassoon Trophy, for navigation, by No 57 Sqn (Victors). Individual crew winners were Sqn Ldr M. G. Beavis and crew of No 617 Sqn (Vulcans), for combined bombing and navigation; Sqn Ldr W. B. Young, No 10 Sqn, for bombing; and Wg Cdr H. M. Chinnery, No 138 Sqn (Valiants), for navigation.

Cpl Pauline Saunders, WRAF, looking at one of the eight books of remembrance which are to be dedicated at St Clement Danes next Sunday. They contain 105,000 names of those who gave their lives whilst serving under RAF command during the war, inscribed by members of the Society of Scribes and Illuminators

Cyprus to Salisbury

LATER this month (from May 15) the School of Land-Air Warfare at RAF Old Sarum, near Salisbury, is to have a new Commandant: AVM C. T. Weir, CB, CBE, DFC, takes over the post after having been SASO at Near East Air Force headquarters in Cyprus. He is an armaments specialist and went to Christmas Island in 1956 as Task Force Commander for the nuclear tests in the Pacific.

AirCdre Innes-Crump

RADAR had been the primary concern of Air Cdre J. E. Innes-Crump, MA, AFRAeS, who died suddenly on April 19 at the age of 46. During the war he was Chief Signals Officer of No 12 Group, then Deputy Director of Signals at Air Ministry; after it, he became Chief Signals Officer at AHQ Malaya and in the early 1950s headed the Electronics Branch at SHAPE. One of his more recent appointments was that of Superintendent of the MoA air stations Defford and Pershore. He had been Director of Air Staff Briefing at Air Ministry since July last year.

Anniversary Concert Début

FOR Wg Cdr J. L. Wallace, Wednesday evening of last week must have been a proud occasion: the first time he had conducted the Central Band in an RAF Anniversary Concert at the Royal Festival Hall. He shared the rostrum with Sir John Barbirolli, whose appearance with the Hallé Orchestra at these concerts is now a happy annual tradition; and there could hardly have been a greater contrast between the two figures: the tall, uniformed, bespectacled bandmaster with martial baton; the small, lithe figure in evening dress, without a baton (Sir John's recent injury to his right arm precluded his using one), imperious but mercurial, an amalgam of Napoleon and Chaplin. It was a pleasing tribute that Wg Cdr Wallace should have invited Sir John—"in view of all he has done for the Royal Air Force"—to conduct the RAF March played by the band and the Hallé. Fou Ts'ong, the Chinese pianist, was soloist in Mozart's gay F major Concerto.

IN BRIEF

A Vulcan of No 101 Sqn made a ceremonial flypast over Freetown, capital of Sierra Leone, during the country's independence celebrations on April 27.

No 208 Sqn, which supplies the official aerobatic team of Middle East Command (Aden), now has a new CO, Sqn Ldr M. S. Goodfellow—formerly a test pilot with the RAF unit at RAE Bedford—having taken over from Sqn Ldr R. Ramirez.

AIR COMMERCE

The Board's Moment of Truth

BY THE AIR TRANSPORT EDITOR

MAY 16 is the date tentatively fixed by the Air Transport Licensing Board for the opening round of its hearings into Cunard Eagle's bid for the North Atlantic route. How long these will last remains to be seen; speculators suggest two or three days. Then, as officially announced by the Board, the equally portentous hearings into the same independent's bid for a network of European routes, together with a similar bid by British United Airways, will open at Therese House on June 20. These hearings, because they involve also a clash between independents, will be more complicated and hence long drawn out. Indeed, they look like being truly heroic in duration, because other "related" applications are scheduled to be dealt with at the same time—from Overseas, Tradair, Silver City, Starways, East Anglian, and even some from BEA and BOAC. The arguments for and against nearly 100 applications from ten operators are down to be heard—including BUA's contentious applications for services to the Far East.

The Board has set aside five days for this hearing; if each takes as long as the recent relatively uncontroversial case about BEA domestic freight rates, the Board will be lucky if the hearing is finished in five months—especially as appeals seem inevitable.

At any rate, within three months of opening shop, the Board is to be confronted with test-conflicts which raise the most fundamental of all questions: Should Britain's independent airlines be given a share of BOAC's and BEA's international scheduled services?

It was to primarily resolve this very question that the Air Transport Licensing Board was set up, and its moment of truth approaches. It is timely to attempt to define the problems involved, and to try to anticipate how they can be handled with the minimum waste of time.

The questions to be resolved fall under three main headings:

(1) *Is it desirable, from the point of view of British politics, for the State corporations to share their business with private companies?*

(2) *Is the designation of a second carrier on a given route economically desirable?*

(3) *Is the designation of a second British carrier on a given route likely to cause international political repercussions?*

There is no need for the Board's time to be wasted with any discussion of the first question. Parliament has changed the law to give private airlines the right to apply for any route. The independents will not, it is to be hoped, waste time or bore people with arguments about the benefits of private enterprise; these arguments are accepted and the independents have been given a *prima facie* right to a share of BOAC and BEA business. And history is on their side; in 17 years the independents have gained in stature and responsibility and have won political acceptance of their right to participate in the big-league air transport. As for BOAC and BEA, there is no point in their arguing with the inevitable: when the east wind blows, the only thing to do is to put on your overcoat.

The Economics of Dual Designation

To come to the second basic question; is the designation of a second carrier on a given route economically desirable? Having ruled that political diatribe is a matter for the history books, the Board must direct its mind very attentively to this second question, which is simple and straight—is there sufficient traffic on the routes being applied for to justify a second carrier—or, in the jargon, to justify dual designation?

If British United Airways or Cunard Eagle, or any applicants, wish to be granted a licence for a particular route, they must convince the Board that there is sufficient traffic available to two British carriers without unduly affecting the cost level of the route. The BOAC and BEA counter-arguments must be aimed at convincing the Board that there is not sufficient traffic to justify dual designation without increasing the cost level. Any other economic arguments, such as the rate at which traffic has been growing, or material diversion, are of secondary importance. The basic question, it cannot be too often repeated, is: What is the traffic on the route and is it sufficient to justify a second carrier?

This question does not, as many might think, fall into the same class as "How long is a piece of string?" A number of attempts have been made, by authorities in this country as well as in the USA, to provide a scientific method of answering it. One such authority is Mr Stephen Wheatcroft, who, in a Royal Aeronautical Society lecture last December, dealt with the question of how much traffic is necessary to justify dual designation. "It will be essential," he said, "for the new Air Transport Licensing Board to form a judgment on this question." He presented a graph, published on page 1029 of *Flight* for December 30, suggesting the traffic volume required to sustain competitive air services.

Another authority is United Research Inc, which prepared an analysis *Competition Among United States International Air Carriers* on behalf of the White House in October 1960. One of the conclusions of this study, which all the parties to the coming hearings should have read, was that "the *minimum* standard for the dual designation of US international carriers is the development of the route to the point where US carriers can be expected to have available to them a minimum of 116,000 passengers a year in both directions, i.e., 58,000 each way." If the route is a highly seasonal one, this minimum would be higher. This conclusion, assuming stage lengths of over 2,000 miles and aircraft of 130-seat capacity, tallies remarkably closely with an extrapolation of Mr Wheatcroft's graph, which covered various aircraft capacities and stage lengths.

There is room for many differences of opinion on this subject: but these opinions, if they are presented to the Board, must be based on sound research. Indeed, the whole subject calls for very much more research, and this is one of the reasons why so many people want the Board to have a strong scientific staff to analyse independently important technical questions such as this.

The Essential Question

The parties to the case should first and foremost offer the Board statistical evidence and argument based on thorough-going research into the essential, simple question: Will the route under discussion bear two carriers without ruining its economics?

The fact that British United Airways and, it is believed, BOAC are retaining legal counsel to sway the Board does not raise hopes that arguments will be confined to the essential economic issues. It will be a pity if the Board has to suffer legalistic huffing and puffing: the professional skill of hired advocates in argument and cross-examination must be devoted to convincing the Board of the economic case for or against an application.

Having dealt with the economic arguments for and against an application, the Board can then allow discussion of the third essential question (which must not be allowed to confuse the economic issues just discussed): *Is the designation of a second British carrier on a given route likely to cause international political repercussions?*

The Board, as we all know, has no powers over the negotiation of foreign traffic rights, and there is no guarantee attached to any of its licences that these traffic rights are available. But it cannot avoid becoming involved in foreign politics, because among the matters which it is statutorily required to consider are the financial and commercial arrangements entered into by British airlines already licensed for the routes under discussion.

Both corporations are bound to lay heavy emphasis on their conviction that the licensing of a second British airline for most routes (one exception being the North Atlantic) will jeopardize relations with foreign carriers. For example BEA, who are in pool with all their foreign rivals, will assert that pool agreements are in the public interest, that they have enabled foreign protectionism to be bought off, opening doors that would otherwise have been closed to British traffic growth and the reduction of fares. The corporation will say that pool agreements with foreign carriers will be jeopardized, and in some cases invalidated, by the designation of a second British airline.

In reply the independents may argue that BEA have no exclusive right to commercial relations with foreign airlines, and that, in a pool, three is company and not a crowd. The Board cannot of course bring diplomatic pressure to bear on foreign governments to require their airlines to take British independents into partnership. But what it can and must do is to call for full information about existing pool agreements, so that it can make its own judgement about their value. As the corporations have no doubt realized, pools will be useful instruments for obstructing the independents and for confusing the economic issues.

There is another reason why the Board must be fully informed about pooling. The licensing of an independent may, it seems, be conditional upon that independent operating in pool with BEA or BOAC; but how independent is an independent if it is in pool with a corporation?

To sum up, the Board's time need not be wasted with domestic politics; and though foreign politics will have a bearing on most applications, they must not be allowed to confuse the *essential* question: Is there enough traffic for two British carriers to compete for without wrecking the economics of the route concerned?

HARSH WORDS ON THE DUTCH POLE-VAULT

ONCE again KLM is at loggerheads with the US air transport industry over traffic rights for the Dutch airline in the United States. A recent State Department announcement that the United States is willing to open negotiations on a polar route for KLM to Los Angeles has drawn bitter remarks from the president of the US Air Transport Association, Mr Stuart G. Tipton. He claims that as only 27 per cent of the traffic carried to and from the US by KLM originates or terminates in the Netherlands the Dutch are violating capacity provisions in the bilateral agreement between the Netherlands and the United States.

Although KLM has been badgering the US for the right to operate into Los Angeles since 1957, when the airline was granted a New York - Curacao route with rights at Huston, Mr Tipton says now that the present negotiations will be "a mere formality" and that the State Department might just as well have announced immediate rights for KLM to Los Angeles.

KLM's answer to these charges is to argue that if US carriers want to share traffic to the Netherlands, they should operate more direct services. And as nations with little to offer in the way of traffic rights have always done, they bemoan the lack of economic freedom in civil aviation. "Restriction of freedom in the air," states the preamble to the 1960 Annual Report (see page 606), "is reflected in the still widely fostered principle of *quid pro quo*, with all its inherent discriminatory elements—which must therefore be considered totally inadmissible. Such a principle amounts to bilateralism applied exclusively to air policy questions with complete disregard of other economic considerations."

The report uses the request for permission to operate to the west coast of the United States as an example of Dutch economic reasonableness, and of the restrictive attitude adopted by other States. Some harsh words have been spoken by the Dutch on the issue of traffic rights at Los Angeles. The willingness of the new administration to re-open negotiations now is for them an important victory on a matter of principle, especially as it comes at a time when the US is strongly resisting further invasion of their own rich markets by foreign airlines.

ANY MORE FREIGHTER MK 31s?

AFTER 14 years Bristol have been proved right in New Guinea. In 1947, one of the early Bristol Freighters demonstrated there met with bad luck, the aircraft being destroyed. But Bristol have always believed that the Freighter was the right aircraft for operations in that territory.

Last month TAA surprised the Australian industry by an announcement that they had ordered two Bristol 170 Mk 31s from Pakistan (this was just about the only tightly kept secret in Australian aviation for many years). The aircraft will be flown to New Guinea early this month and will be operated solely on the run from Madang to the Highlands.

The purchase was an immediate result of restrictions by the Australian Department of Civil Aviation on DC-3 loadings in Papua and New Guinea, which has meant an average 20 per cent cutback on most development routes. The Pakistani Freighters were offered at prices from £5,000.

This is the first time in several years that TAA has caught Ansett-ANA by surprise, and on the day the deal was announced Ansett-ANA decided to send a representative to Karachi to see if any Mk 31s were left. They intend to buy three—one for the Australian mainland. The sole remaining Freighter the airline inherited from ANA has run out of the number of landings permitted and would cost too much to modify.

TAA have work for about 1,800hr a year per aircraft on the Madang - Highlands run, purely on freight, for no passenger-carrying will be permitted. They hope to secure enough further charter work to bring the total utilization to around 5,000hr a year for the two aircraft together. The Mk 31s have a landing life of 9,000, which means about 10,000hr. TAA do not intend using the aircraft for more than three years, and are already looking at the Argosy as a possible replacement, so modification does not worry them.

PIA PLANS AHEAD

A CHARACTERISTIC, if surprising, feature of Pakistan International Airlines' operations is the sensitivity of its traffic to the introduction of new equipment. This is true even in parts of the world where standards of living are low and where a sophisticated view of air transport is hardly to be expected.

Within two years of Viscounts being introduced on the service between Karachi and Lahore, traffic more than doubled; and traffic on the Dacca - Chittagong sector has risen from 38 to 60 passengers a day since the Friendship came to East Pakistan in January. When a jet service was introduced between Karachi and London it flew into profitability within a few months. Load factors fell when frequency was trebled last October but by this spring the route was again making money. Profit on the jet services in March was nearly £40,000 and the trend is expected to continue as traffic builds up through the summer season.

From the beginning of this month pilots on Aer Lingus-Irish International Airlines transatlantic flights will be wearing this new uniform, later to be adopted on all routes. The colour is the familiar midnight blue and it is woven from Irish Terylene-and-wool yarn

This is the background to PIA's order for three Boeing 720Bs, announced last week. If the new 12,000ft runway at Dacca, East Pakistan, is completed in time, the first will be introduced on services between the east and west wings of the country in January. Of the total cost of £9.6m for the aircraft and spares, 20 per cent is being found immediately from PIA's own resources. The remainder is to be financed by a loan from the Export-Import Bank and to be repaid entirely from the airline's future profits. These were £480,000 in 1959-60 and this year are expected to be about £690,000.

From this favourable balance PIA will both meet its loan commitments on the Boeings and will tackle another long-term objective: the balancing of foreign expenditure on internal operations against income from international routes. For this purpose a 30 per cent revenue increase will be necessary in 1961-62 and a further 24 per cent in 1962-63.

Two factors which favour this attempt to become independent of Pakistan's slender foreign-exchange resources are PIA's rapid rate of expansion and the strenuous efforts which are being made to keep costs down by increasing efficiency. In the past two years revenues have increased by more than nine-tenths, overtaking total expenditure; and about 85 per cent of all PIA's routes are now profitable. Over the whole network a schedule regularity of 87 per cent was achieved in 1960, and on the Boeing service the figure for March this year was 93.5 per cent.

The airline's immediate plans include the introduction of a New York service this month, to be followed by twice-weekly Boeing 720B services between Karachi and Dacca from early next year. Eventually transatlantic frequency will be increased to three times weekly, the Karachi - London operation will be increased to four services a week, and the Karachi and Lahore - Dacca services will be served solely by jets. The 707-320 leased from PanAm will be retained when the Boeing 720Bs have been delivered.

Japan Air Lines services to London from Tokyo are due to start, at twice-weekly frequency, on June 7. Here on a pre-inaugural flight is Mr K. Ishikawa, JAL's vice-president, accompanied by his daughter. On the right is a JAL stewardess

An even longer title than the one adorning Irish International Airlines aircraft (see photograph on page 544, "Flight", April 20) appears on the two KLM DC-8s chartered to VIASA. It reads: "VIASA Venezolana Internacional de Aviacion SA, Royal Dutch Airlines Interchange"

AIR COMMERCE . . .

KLM ACCOUNT FOR THEIR YEAR

ANY book-keeper can balance an airline's books. But only a skilled accountant can prepare the year-end accounts to make it difficult to see whether or not the year showed a profit or a loss. KLM employ highly skilled accountants.

The latest results published by KLM show a reduction of profit from Fl 15m in 1959 to Fl 10m in 1960; but if a comparison is to be made between the two years' figures three factors must be taken into account. First, the 1960 figure does not allow for a loss of Fl 7m arising out of the Electra's teething troubles—this amount is not charged against revenue but is met by withdrawing a provision set up some years ago. In the second place, the 1960 figure excludes a charge of Fl 20m which represents extra depreciation on the airline's over-valued fleet of 13 DC-7s; this item is covered by adjustment to revenue reserves. And, finally, the initial costs of introducing new aircraft (Fl 14m in 1960, Fl 9m in 1959) are now being amortized instead of, as in the past, being charged against revenue as incurred. This explains why, in a year when this cost rose, the accounts actually show a fall from Fl 9m to Fl 3m. With these three qualifications in mind, it is fair to say that 1960 was a very bad year financially for KLM.

To put this record in perspective, it must be recalled that the airline's past financial record is exceptionally good for a European operator, and that few other European airlines have been able even to make a pretence of being profitable in the difficult year just past. The clue to KLM's above-average performance last year was their unusual ability to generate new traffic as fast as they generated new capacity; in each case 1960 showed an increase over 1959 of 19 per cent, the load factor remaining a shade under 60 per cent. Another element in KLM's relatively successful record was their ability to keep costs down. Admittedly, reduced fuel costs played a big part here (the fuel bill actually fell last year, despite a one-fifth growth in operations). But tight control over recruiting—staff numbers rose by only 7 per cent to 18,609 by the year-end—allowed the company to avoid the difficulties that many other airlines are experiencing. This tight control, allied to the attractive economics of new aircraft operated at KLM's traditionally high utilization rates, has led the report to prophesy that "we anticipate a decrease in average tonne-kilometre operating costs."

The main facts recorded in the report may be simply stated: total revenue up 12 per cent to Fl 612m (equivalent to £61m at ten guilders to the pound); average revenue rate down 6 per cent to Fl 1.50 per tonne-kilometre; total costs somewhere between Fl 531m and Fl 645m, depending on choice of accounting method; average operating costs just under one guilder per a.t.k. (about 34 pence per c.t.m.); total passengers 1.4m at an average haul of 2,170km; aircraft utilization rates—8hr 20min intercontinental, 4hr 50min regional European and Caribbean; total load 366m tonne-kilometres; total capacity 642m tonne-kilometres; total fleet 102 aircraft, including 17 aircraft out of service (mostly Connies and Super Connies lying disconsolately around Schiphol).

As usual, the KLM report is very tastefully presented, editions being available in both English and Dutch. Except in the matter of the financial adjustments referred to in the second paragraph above, a very frank and lucid account is given of the company's recent past and of its anticipated future. A theme that runs right through the report is the twin need to reduce costs and to liberalize the exchange of traffic rights. The recently concluded pact with Venezuela's new flag line, VIASA, is a step in this direction. The report hints that the next step could well be a form of closer collaboration with SAS and Swissair. This indeed would represent a bargaining power that could make liberalization a real force in world airline politics.

VERDICT ON BEA'S PILOT DISPUTE

THE Industrial Court has now issued its report on recent differences between the employees' and employers' sides of the pilots' panel of the National Joint Council for Civil Air Transport. These differences concerned BEA's 1960-61 schedules, and were in addition to the question of a fourth sector per duty day for Comet captains; related questions such as simulator hours, meals in flight and night duty were also considered.

The pilots felt that basic rosters showing duty times should be submitted to them for agreement in order to avoid excessive workloads, but BEA thought this to be unnecessary, as it was obligatory for the corporation to observe the provisions of the Scheduling Limitations Document. This latter consists of paragraphs 13-24 of the recommendations on pilots' duty limitations drawn up in 1957 by a joint working party of pilots and BEA management. By the summer of 1959 it was evident to the pilots that the document was not having its intended effect: the corporation could, they felt, schedule within the limitations and still subject the pilots to unreasonable workloads. Internal agreement could not be reached, and a board of arbitration awarded that the document should continue to apply, with adjustments to certain paragraphs and the addition of an extra one.

The pilots wanted to retain the right to agree because the limit on the length of a duty day—12½ hours for a three-man crew during the summer—was high. This limit was accepted as reasonable in certain circumstances but was one that the pilots claim was never intended to be applied day after day, the scheduling limitations document containing its original requirement that pilots' duties in any seven days should not be excessive. This clause, the pilots claim, gave them the right to agree to or to withdraw approval from the basic roster. BEA's view was that the pilots "had made every attempt to destroy those aspects of the [board of arbitration] award which did not fulfil their expectations," and that having sought and obtained the decisions in the award they should be

Experimentally installed at Schiphol is this prototype telescopic Aviobridge developed by the Aviolanda Aircraft Company. It can be extended between 60 and 100ft and positioned in just over two minutes. If required the bridgehead can be lowered to floor level for aircraft with rear loading like the Caravelle. Operating load is 18kW

TCA operated its inaugural Vanguard flight to the West Indies on April 1. In the foreground of this photograph, taken at Piarco, Trinidad, are (left) Mr Ray Pearson, Shell Aviation Manager for Trinidad, and Mr John Marshall, Rolls-Royce representative

required to abide by the terms of the scheduling limitations document.

The Industrial Court's decision is that BEA shall submit the proposed roster to pilot representatives for their inspection and comments, the roster being determined by BEA after due consideration has been given to any representations made by the pilots. The Court also rules that 50 per cent of the time spent by pilots in the simulator shall be reckoned as flying time; but they do not concede the pilots' claim that "night available duty" should be followed by a minimum of 11½ hours free of all duty.

ALWAYS AMPLE OPPORTUNITY

LATEST publication on the subject of near misses comes from the FAA. Published by the Bureau of Flight Standards, release No 443, it reports that the number of mid-air collisions involving US general aviation aircraft in 1960 was nearly twice the number experienced in 1959.

The collisions (24 in all, of which ten involved fatalities or injuries) are listed and the conclusion is that "the elimination of all collision accidents cannot be achieved by the positive control of air traffic, or by the segregation of slow and fast traffic. But the record can be substantially improved, says the report, by "*the exercise of constant vigilance on the part of all pilots.*"

The report notes, in capitals, that in each collision reported one or both of the pilots involved had ample opportunity to see and avoid the other aircraft.

IRISH INDEPENDENT'S INAUGURAL

ON Sunday, April 16, the new Irish Independent Skycraft International was to inaugurate a service between Belfast, Dublin and Bournemouth. Skycraft International is an associate of Air Safaris and will operate the new service on a twice-weekly return basis with 36-seat Vikings. No rights have been granted between Dublin and Belfast and the return fares are £12 11s from Dublin and £10 18s from Belfast. Flying time between Dublin and Bournemouth is 105min and between Belfast and Dublin about 45min.

CONVAIR 880-Ms FOR SWISSAIR—

NOT everything has gone well with the flight test programme of the Convair 990. As reported a few weeks ago, wing flutter was encountered at indicated airspeeds of about 350kt and a lack of elevator effectiveness was found at full forward c.g., possibly caused by turbulence from the inner leading-edge flaps.

As anticipated, Swissair are to lease shorter-range Convairs pending rectification and delivery of the 990 Coronados, and it was announced by Convair last week that these would be two Convair 880-Ms. They will be delivered "late this summer" for service on Swissair's Far Eastern routes. The airline says that this will be approximately the time planned for the Coronado, although the original delivery date for the 990s was in March. The 880-Ms will seat 94 passengers, 64 of them economy class.

—AND CONVAIR'S SUPERSONIC CONCLUSIONS

PRESIDENT KENNEDY has asked Congress to appropriate $10m for the FAA to start development of a supersonic airliner, and Convair's recently published "Supersonic Transport Market Analysis" offers some interesting conclusions. No fewer than 324 basic possibilities were considered, representing the product of 36 different payload/speed/range combinations, three profit-levels for the manufacturer (20 per cent profit, no profit and 20 per cent loss) and one, two or three manufacturers entering the market.

The aircraft considered embrace four speeds (M2.0, 2.5, 3.0 and 3.5), three sizes (70, 100 and 130 passengers) and three ranges (1,700, 2,900 and 4,000 statute miles). Use of the same powerplants, Pratt and Whitney JT11s, is assumed throughout.

Perhaps Convair's most surprising conclusion in favour of Mach 3 is that "with two qualifications, there is no clear advantage, either in operation or in economics, for any design cruising speed between about Mach 2.0 and Mach 3.0;" this assumes an operational life of 30,000 hours. Steel or titanium will provide a built-in stretch to permit still greater speeds in line with technological advances, and because of this a commercial aircraft will probably be developed using these materials.

British eyebrows will be raised still further by Convair's assertion that this "would immediately preclude a market for an aluminium airframe"—which could conceivably be obsolete even before it enters service.

More logical is the conclusion that any supersonic airliner must be able to operate economically in a coach market, although it may for a limited initial period be confined exclusively to first-class services at premium fares. In view of this, Convair concludes that a 60/80-passenger aircraft is too small to be economical, while although a 140/150-seater would have better operating costs it would be too large, too heavy and need too many engines to fit into existing airports and serve secondary traffic centres. The optimum size in Convair's view is a 130-passenger M3 aeroplane, and the direct operating costs for such a vehicle are estimated at 1.29c per seat-mile over a design range of 4,000 miles. The 100-passenger and 70-passenger studies have d.o.cs. over this distance ranging from 1.49-2.05 cents for the former, and 1.90-2.71 cents for the latter, according to Mach number. The 130-passenger aeroplane is considered to have better specific costs at other than its optimum range, having a d.o.c. of 1.67 over 1,150 miles, which compares with the Convair 880's 1.40 cents/seat-mile over the same distance. But it should be emphasized that these costs are based on

To be delivered this month is the first of three Boeing 707-420s (Rolls-Royce Conways) for El Al, seen here taking off from Renton on its first flight. El Al have been operating a leased Boeing 707 on the Atlantic since January and the -420 will enter service in June

Lord Douglas, chairman of BEA, accepts from Mr W. S. D. Lockwood, managing director of Armstrong Whitworth, a model of the Argosy. The occasion was the signing of BEA's order. Mr E.D. Keen, chief designer of AWA, presented another model to Mr Milward, chief executive of BEA. *See page 582*

AIR COMMERCE...

the assumption of one manufacturer enjoying a monopoly of the supersonic market and making a 20 per cent profit.

"The supersonic airliner is ideally a one-manufacturer program," say Convair. "Two competing manufacturers present a marginal situation, while three or more would mean financial disaster for some or all of the competitors." The effect of having to share the market for a 130-passenger M3 airliner (again assuming 20 per cent profit) is that its estimated one-manufacturer cost of $14.1m (excluding spares) would rise to $17.4m for two manufacturers and to $20.1m if three firms shared the market. If the cost of manufacture is increased by 50 per cent, the direct operating cost should increase by only 12 per cent. Convair estimate a potential market of about 150 of these aircraft during 1970-75.

Lack of adequate supersonic cruise experience is a big difficulty in assessing commercial prospects in this field, and Convair has only about 500 hours of Hustler flying above M1.5, and far less at or above M2, on which to draw. A test quantity of 12 M2.4 transports derived from the B-58 could provide such experience and help establish the necessary standards at an estimated $237m.

DOWN WITH THE CORPORATIONS

"LET'S face hard facts. If you took away the independent airlines [from London Gatwick] the only real flying at the airport would be done by the birds." This was the best passage in a series of three articles published on April 19, 20 and 21 by the Brighton *Evening Argus*. The articles were entitled "The Frightened Men of Flying"—these, by implication, being the managements of BOAC and BEA.

The three articles have upset quite a number of people in BOAC and BEA. It follows that the features will have delighted British United Airways, whose case for a share of BEA's and BOAC's business was advocated by the author in some of the purplest passages seen in aviation writing for a long time. The general tone of the articles may be exemplified by the following extracts:—

"If the frightened men succeed in throttling British United Airways, the £15 million independent airline, the Government will stand convicted of outrageous double-talk. That wouldn't worry the State airline bosses. All they care about is holding on to their monopoly. Life has been cosy for them, cocooned in an all-pals-together pod. British United Airways—with its go-ahead plan for Gatwick, for British aviation, for the man-in-the-street—has shattered their dream-world. And the State airlines are faced with one stark fact: they cannot stand competition from a British independent airline. Result: A commercial stranglehold on British United. Wrapped up in platitudes. Hidden behind clouds of airy-fairy talk. But still a stranglehold."

Another, referring to remarks by Lord Douglas:—

"And as a throw-away came the tit-bit that last January was 'financially the worst month we have ever had'—BEA losing more than £800,000, the bill being footed by the taxpayer. Incredible, isn't it? If BEA made a loss, then it's logical that foreign airlines collared the business. But when a British private company come along and say they can win some of that business back for this country, the State objects! And even if British United failed, the only people to suffer would be their shareholders. Not an already over-taxed nation!"

The following were some of the adjectives applied to the corporations: stubborn, dog-in-the-manger, ruthless, plaintive, bleating, impersonal.

The articles made some good points, but were spoiled by overemphasis. The exaggeration of the corporations' shortcomings, and the inaccuracies, may well have affected some *Evening Argus* readers in a way opposite to that intended. Perhaps the corporations should reply by taking the writer out to lunch as a reward.

BREVITIES

A fourth Boeing 720 has been ordered by Braniff, for delivery in May 1962.

One of Papuan Air Transport's Piaggio P.166s, reported missing on a flight from Popondetta to Port Moresby on March 8, has not yet been located. The aircraft was not carrying passengers.

By December 1 this year all jet aircraft in the United Airlines fleet will be equipped with DME. An order for 138 units, costing more than $1m, has been placed with Collins Radio. The airline's 20 Caravelles will be DME-equipped before entering service.

TAP has become the fifteenth member-airline of the Air Research Bureau, it was announced at the assembly of airline presidents in London on April 26. The ARB is to set up an air transport management course which would be open to member-airlines and others.

According to *Interavia*, Air Africa, the new airline to be formed by African states in the French community, will have an initial capital of 500m CFA francs. UAT and Air France will share 44 per cent of this capital. Headquarters will be at Abidjan and the initial fleet may comprise 15 Douglas DC-4s.

The Association of Supervisory Staffs, Executives and Technicians appears to be ready to call a strike "to bring working conditions of its members who are employed by independent airlines up to the level of those of BOAC and BEA." The dispute has been brought to a head by the independents' applications to the Air Transport Licensing Board to compete with the corporations.

As a result of an air-conditioning defect in the Vanguard, since overcome, HM the Queen was flying to Sardinia last Saturday in BEA Comet G-APMG. The same aircraft was to be used by HM Queen Elizabeth, the Queen Mother, to return to London the same evening, and tomorrow, May 5, this Comet will again be used to fly Her Majesty the Queen and the Duke of Edinburgh from Rome to Falconara, Ancona.

Asked in the Commons on April 24 whether he would publish the findings of the report into the near-miss in the London Airport area on February 21, Mr Peter Thorneycroft, Minister of Aviation, said: "I have given the national authorities concerned [Canada and the UAR] an opportunity to consider the results of the investigations before deciding whether they should be published." He agreed that it was probably desirable to publish this information as soon as possible, but he was satisfied with the system of control at London Airport, and so were the pilots.

Today, May 4, the Air Transport Licensing Board will hold its seventh public meeting. The application to be heard is that from British United Airways, for a licence to operate on the route London Gatwick - Guernsey/Jersey. The objectors are BEA, Cunard Eagle and Jersey Airlines. The meetings begin at 2.30 p.m. at Therese House, 29-30 Glasshouse Yard, Aldersgate Street, London EC1. Public meeting No 8 will take place tomorrow, May 5, when a number of inclusive tour and closed-group applications by Overseas Aviation—variously objected to by BEA, Silver City and Skyways—will be heard. Tyne-Tees Air Charter also are applying for an E licence.

Central African Airways have appointed Mr John Lunn, consultant designer, to re-design their Viscount interiors.

Aeroflot's Tu-114s entered service on the 4,350-mile route between Moscow and Kabarovsk on April 24, the distance being covered non-stop.

One of Japan Air Lines' DC-8s, registration number JA-8003, is thought to be a write-off after over-running the runway at Tokyo Airport on April 24 at the end of a flight from Honolulu. One passenger is reported to have been injured and the cargo slightly damaged.

The Minister of Aviation told the Commons on April 24 that £5,000 will be the salary of Prof D. T. Jack, chairman of the Air Transport Licensing Board. The deputy chairman, Mr A. H. Wilson, will receive a salary of £2,750. The other Board members will receive 15 gns per session.

ALA Austral of Buenos Aires has ordered four Fokker Friendships (Dart RDa.6s) for delivery in March and April 1962. This is the first company in the western hemisphere to buy Friendships from Fokker, following a recent agreement between the Dutch company and Fairchild.

For the record, Riddle postponed inauguration of scheduled commercial Argosy operations (due to start last February) following the problems that arose with tailplane and flap skin cracking. Interim modifications were completed on Riddle's first three aircraft by the beginning of last month, enabling Riddle to complete 100 hours of proving and FAA flying. At Coventry two further aircraft modified to the interim standard will be delivered this month, and the final two Argosies will be delivered in June following the installation and testing of new control surfaces.

Capt William Baillie was commander of the BEA Comet 4B G-APMG which flew the Queen and the Duke of Edinburgh on the start of their state visit to Italy on April 29. Capt Baillie has flown members of the Royal Family on four previous occasions

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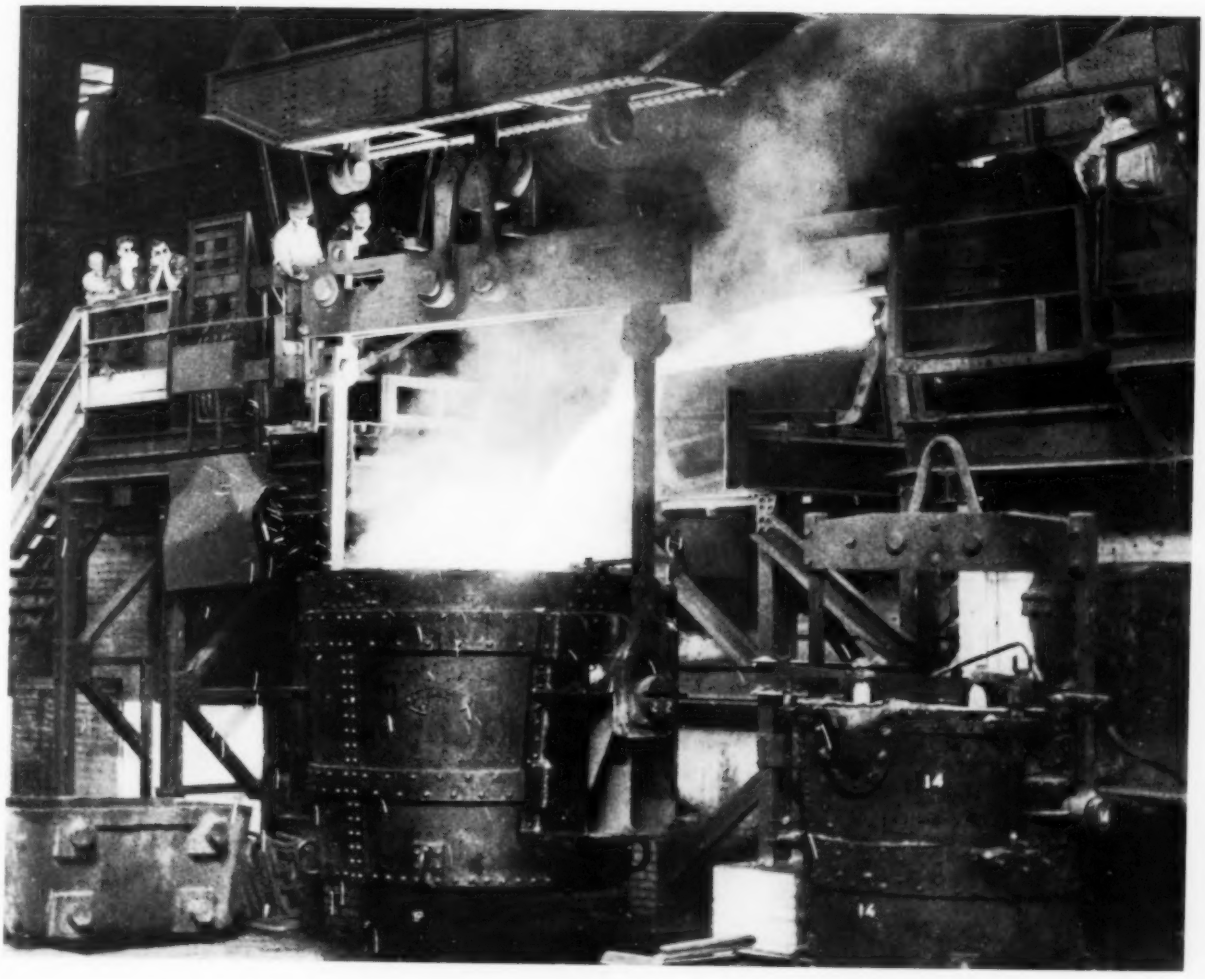

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